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Management Plan for Pronghorn Antelope in Alberta

Alberta

MANAGEMENT PLAN FOR PRONGHORN ANTELOPE IN ALBERTA

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PREFACE

The plan presents the Fish and Wildlife Division's goals, objectives and management strategies for the management of pronghorn antelope in Alberta, and will be periodically updated and revised as necessary. Implementation will be subject to Divisional priorities established during the budget process.

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MANAGEMENT PLAN FOR PRONGHORN ANTELOPE IN ALBERTA
EXECUTIVE SUMMARY

Historical Populations, Use and Management

Pronghorn antelope in Alberta are at the northern limit of their range and are subject to wide fluctuations in numbers because of climatic extremes such as extended dry periods and severe winters. Pronghorns were still relatively numerous at the beginning of the 20th century but the severe winter of 1906-07 decimated their population. They remained low in number through the next two decades with estimates of fewer than 2000 animals. Numbers increased to an estimated 30 000 in 1945 and have fluctuated widely since that time (estimates ranging from 4000 in 1949 after the severe winter of 1948-49 to 32 000 in 1984 after several mild winters and moderate harvests). The July 1989 population estimate was 22 000 animals.

European settlement of the prairies brought livestock and intensive cultivation (particularly after the advent of irrigation). Thirty-six percent of the total antelope range had been converted from native grass prairie to cultivation by 1983, with 6 of the 36 percent undergoing conversion between 1970 and 1983. On the 12 important winter ranges, 14.4 percent is cultivated with 4.7 percent having been converted between 1950 and 1983. Fences associated with livestock management can impede movements to and from winter ranges. Transportation corridors such as railways and highways may be the sources of significant numbers of collision mortalities in winters of deep snow, when antelope use these snow-free areas.

Antelope were used as a source of food and clothing during the early settlement of Alberta. Today they provide hundreds of thousands of days of recreation for both hunters and nonconsumptive users. Hunting demand has been high since populations recovered from extremely low levels in the early 1900s. Licences have been available only on a limited basis since 1957 as demand has outpaced the number of licences available. Currently, about 12 000 hunters are vying for about 6000 licences annually, with trophy antelope being the preferred licence. Antelope are also a popular nonconsumptive focus in the prairie habitat types of Alberta.

Management before the 1950s was limited to changing bag limits, adjusting season lengths, and opening and closing the season. Parks and sanctuaries protected some habitat, but habitat protection efforts were limited. Management now includes population and habitat goals for each of eight Antelope Management Areas, annual inventories of populations, a limited-entry draw to manage the population at goal levels and provide recreation, periodic habitat inventories and a habitat retention program.

Management Issues

The following four major issues must be addressed in future management programs:

1. Recreational allocation systems must be maintained to manage the herd and optimize public use opportunities while recognizing the concerns of landowners.

2. More effective means of retaining and enhancing habitat in cooperation with other land users on both private and public lands must be developed.

3. Antelope population and habitat inventory must be improved to allow more precise population estimates and clearly defined habitat retention goals.

4. Antelope damage must be minimized by managing the herd at acceptable goal levels, by prevention programs and by exploring compensation alternatives such as range improvement for livestock and antelope.

These major management issues must be addressed to maintain the antelope populations at goal levels and provide for ongoing public use of the resource.

The Management Plan - Goals/Objectives

1. The provincial summer antelope population goal will be 18 910 with a population of 15 500 going into winter. It will be necessary to maintain 25 900 km^2 of summer range and 3290 km^2 of winter range (within the 12 identified winter ranges) to meet these population goals. This does not include the C.F.B. Suffield herd which numbers around 2000 to 4000 in the summer and is outside provincial jurisdiction.

2. A variety of hunting opportunities (archery, trophy, non-trophy) will provide for 4770 Alberta residents to harvest 1670 trophy antelope and 1670 non-trophy antelope annually. Limited-entry draws will manage the distribution and number of hunters to provide a quality recreational experience, to manage the resource within each Antelope Management Area and to minimize disturbance to landowners.

3. Nonconsumptive opportunities will be enhanced through the use of print, film and audiovisual material to increase knowledge, and viewing guides and interpretive sites to increase personal contact.

4. Commercial opportunities will be available to those providing outfitting-guiding services. An abundant and widely-distributed antelope population will also help attract tourists to Alberta and produce commercial benefits to those providing goods and services to these tourists.

5. Scientific research and educational activities will be encouraged to enhance our knowledge of antelope and improve management capabilities.

6. Damage prevention, control and compensation programs will continue. Compensation may be extended to include additional crops, but it is still difficult for insurance adjusters to determine damage. Alternatives such as on-farm habitat improvements that benefit both antelope and livestock will be considered.

7. Habitat retention programs will become more effective through a higher degree of cooperation between wildlife managers and those who manage the land within antelope range (e.g., private landowners, range managers, oil and gas companies, mining and thermal power generating companies, irrigation districts).

8. Habitat and population monitoring programs will become more precise to allow population and habitat retention goals to be focused at more local levels and to better measure success in achieving the identified established goals.

1.0 INTRODUCTION

Pronghorn antelope provided food and clothing items for native Indians and European fur traders and settlers during the early settlement and development of the Alberta prairies. Their major present- day value accrues from the thousands of hours of recreational enjoyment by hunters and nonconsumptive users. Pronghorns also enhance the Alberta economy in the prairie area by stimulating the internal flow of resident dollars into the area and by attracting non-residents to use the resource.

The management of pronghorn antelope in Alberta can be a difficult task. They are at the northern limit of their range in this province and accordingly are susceptible to the extremes of climate. Not only will pronghorn succumb to long cold winters, but they will move great distances to avoid deep snow and to find suitable forage; in Alberta this occasionally means that pronghorns migrate into Saskatchewan or Montana and, in some instances, remain there. In recent times, cultivation and intensive cattle grazing have become a threat to pronghorn habitat.

Recognizing the value of the wildlife resource the Government of Alberta declared a "Fish and Wildlife Policy for Alberta" (Fish and Wildlife Division 1982) in October 1982. Part of that declaration, the "Wildlife Policy," specifically stated that the Government is to ensure that wildlife populations are protected from severe decline and are maintained, and that the wildlife resource is passed on to succeeding generations as it was received. The "Status of the Fish and Wildlife Resource in Alberta" (Fish and Wildlife Division 1984) provided a brief statement of the history, the supply and use of pronghorn antelope in 1980, and a general statement of future direction respecting populations and habitat. The purpose of this species management plan is to review the history and current management program for pronghorn antelope in Alberta in more detail and develop comprehensive user, population and habitat goals that will guide pronghorn management over the next 10 years.

2.0 BACKGROUND TO THE PLAN

2.1 Taxonomy, Biology and Requirements of Pronghorn Antelope

2.1.1 Taxonomy and Distribution

The pronghorn antelope, *Antilocapra americana* (Ord 1818), is widely distributed in western North America (Figure 1, after Yoakum 1978a). The pronghorn antelope is the only surviving species of the family Antilocapridae, a family indigenous to North America (Yoakum 1978a). There are presently five recognized subspecies and the most abundant subspecies, the American pronghorn (*A. a. americana*), is the one represented in Alberta. Its distribution in Alberta in 1989 is shown in Figure 2. The terms pronghorn, antelope and pronghorn antelope all refer to *Antilocapra americana* throughout this document.

2.1.2 General Description

The pronghorn antelope is a keen-sighted, gregarious ungulate of the North American plains. The unique feature that has separated pronghorns taxonomically from the bovids is their deciduous keratinized horn sheaths, which are shed annually from ossified cores in response to hormonal cycles.

The pronghorn is the fastest of North American game animals, capable of running at 55 km/h - 65 km/h with short sprints up to 100 km/h (Banfield 1974). The third and fourth digits are developed as cloven hooves, which have a cartilaginous ventral surface to cushion the impact of running hard on irregular surfaces (Kitchen and O'Gara 1982). Pronghorns do not have dew claws and therefore are not as mobile on soft ground or deep snow as other ungulates.

Pronghorns have large eyes (5 cm in diameter), which reportedly are comparable to humans using 8X binoculars (Kitchen 1974). Excellent

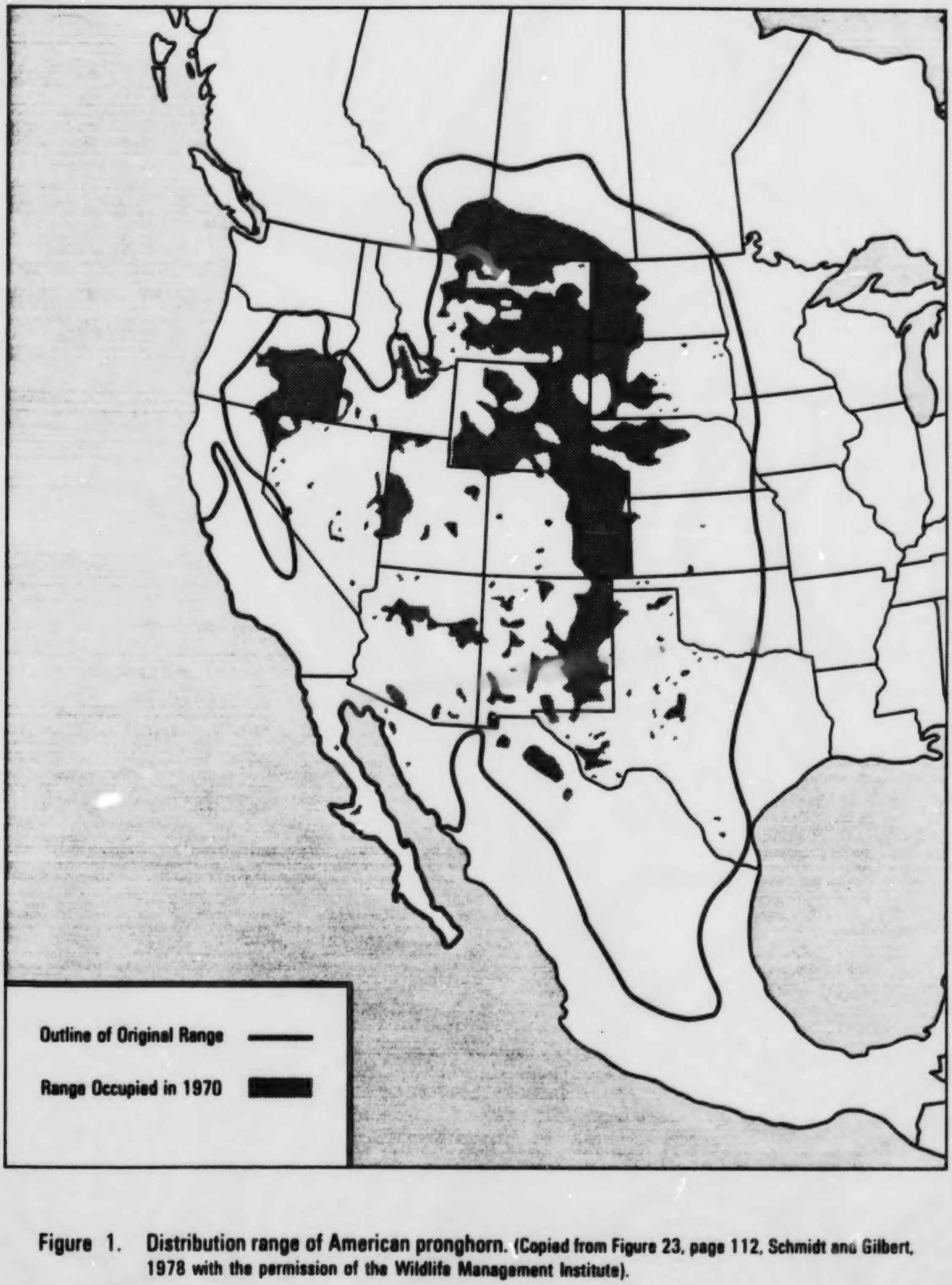
Outline of Original Range
Range Occupied in 1970

Figure 1. Distribution range of American pronghorn. (Copied from Figure 23, page 112, Schmidt and Gilbert, 1978 with the permission of the Wildlife Management Institute).

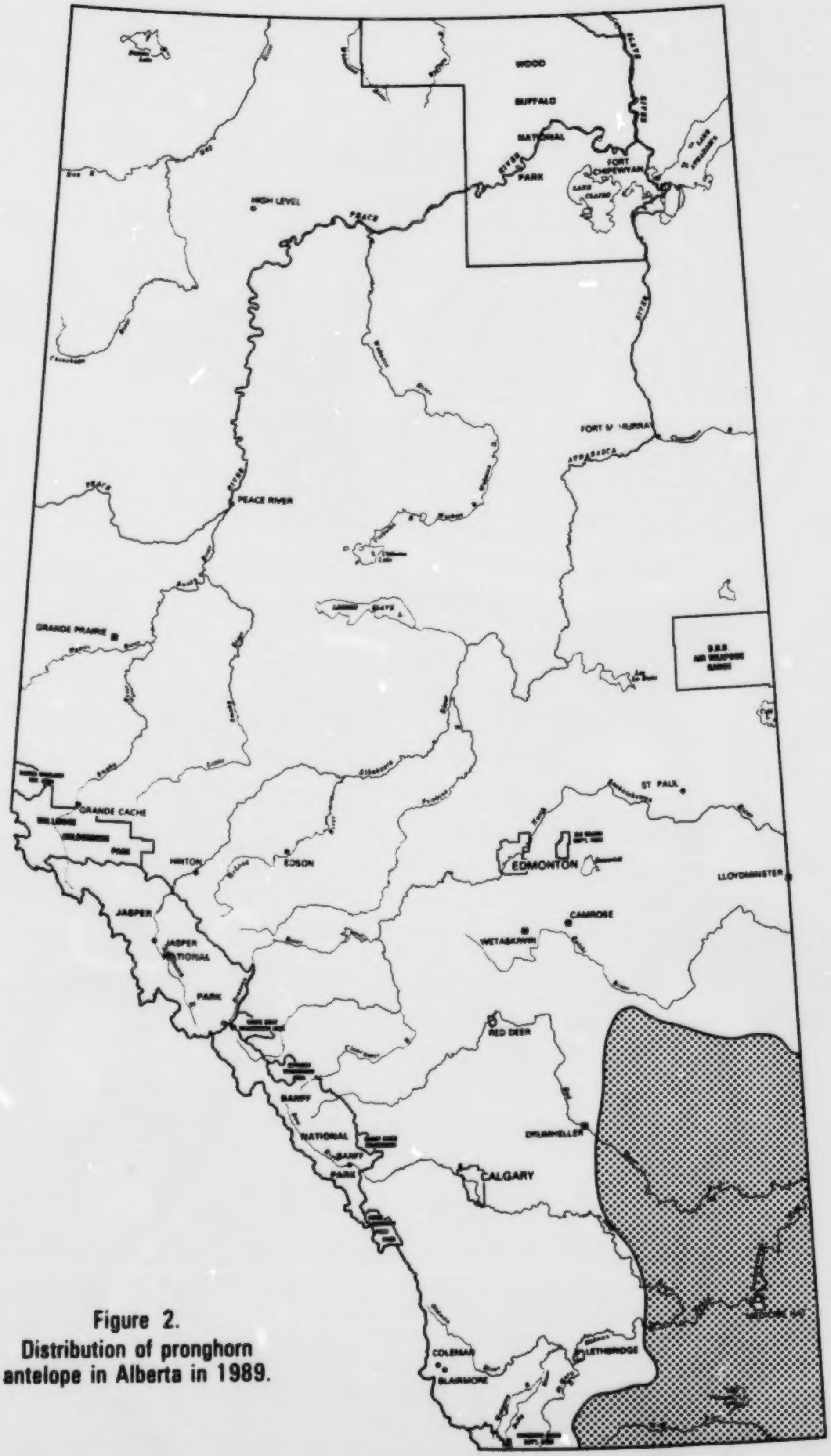
WOOD
BUFFALO
NATIONAL
PARK
FORT CHIPEWYAN
HIGH LEVEL
PEACE
FORT McMURRAY
ATHABASCA
PEACE RIVER
GRANDE PRAIRIE
ST PAUL
GRANDE CACHE
HINTON
EDSON
EDMONTON
LLOYDMINSTER
CAMROSE
WETASKIWIN
JASPER
JASPER NATIONAL PARK
RED DEER
BANFF NATIONAL PARK
DRUMHELLER
CALGARY
MEDICINE HAT
COLEMAN
BLAIRMORE
LETHBRIDGE

Figure 2.
Distribution of pronghorn
antelope in Alberta in 1989.

eyesight provides advance notice so pronghorns can avoid predators in the open landscape that they occupy.

Both sexes are reddish brown to tan on the neck, back and legs. Flanks and belly are white. Males have a black cheek patch and often exhibit darker hair over the nose and posteriorly to the base of the horns. Total body length ranges from 125 cm - 145 cm. In Alberta the mean weight of adult males is 50.5 kg and the mean weight of adult females is 41.5 kg (Mitchell 1980).

Females have four mammae. The dental formula for pronghorns is (I 0/3; C 0/1; PM 3/3; M 3/3) x 2 = 32.

Male pronghorns have upright horns, which feature a triangular prong or branch that extends forward from the anterior aspect of each horn and also an upper portion of each horn that typically curves backwards to the tip. Horns on adult males may reach 51 cm. Horns are often absent in females, but where they do occur they are upright, without prongs and generally shorter than the ears.

Both sexes also exhibit a rosette of white erectile hairs on the rump. These hairs can be exposed when the animal is frightened to serve as an alarm signal to other pronghorns. This white rump patch is obvious over great distances on the flat prairie.

Eight dermal glands in the male and six in female pronghorn provide an array of pheromonal signals for territorial marking, courtship displays, alarm signals and other forms of olfactory communication (Kitchen and O'Gara 1982).

2.1.3 Reproduction

The rut for antelope occurs in the autumn and lasts two to three weeks. Mitchell (1980) showed that most female pronghorns in Alberta had been bred by the end of September. Mitchell (1980) found that female pronghorns in Alberta were polygravid and that multiple blastocysts developed. However, by November most pregnant females were supporting only two embryos. Females normally attain estrus as yearlings, although yearling females have also been observed to produce young indicating that they were bred as fawns (Wright and Dow 1962).

Territorial behavior in males begins with the return to summer range following snow melt and culminates with the rut. Territorial bucks maintain harems of 2-15 does on their territories through dominance displays and herding behavior. This behavior becomes most pronounced during the rut and culminates in the successful breeding of all estrus does.

Barrett (1981) observed that an estimated 75 percent of pregnant does in southern Alberta gave birth between May 23 and 30. Considering that the peak of the rut is mid-September in Alberta, this indicates a gestation period of approximately 250 days. Pronghorn does usually produce twin fawns, which are about 3 kg each in weight. The fawns lack some of the dark adult markings and are beige in colour, which camouflages them from predators. They can walk within a half hour of birth and are completely mobile within two days of age.

Gently rolling or hilly terrain provides the preferred fawning sites for pronghorns. The does remain with their fawns for two to three hours after birth, after which they move the fawns to separate bedding sites, which reduce detection by predators. Fawns spend up to 90 percent of their first three weeks bedded some distance from their mothers. The dam returns at regular intervals to feed the fawn or to lead it away from impending danger (Kitchen 1974).

Fawn bedding sites in Alberta were generally in open, rolling or hilly grassland and in association with some micro-geographical feature such as a depression, a stone, a clump of grass, or a wheel rut. A fawn typically oriented itself with its back against some micro-relief, facing downhill if it was bedded on a slope. Areas with good vegetative cover were not selected for fawn bedding sites (Barrett 1981). At about three to four weeks of age the dams and their fawns group together in nursery herds. The fawns associate almost exclusively with the other fawns except during nursing or periods of alarm/flight when the mothers return to their respective fawns. The fawns remain with the dams for 3.5 to 4 months after which they are weaned.

2.1.4 Mortality

The average lifespan of a pronghorn is 4.5 years; the oldest documented antelope in Alberta from records of incisor sections was

11.5 years of age. Important factors in mortality are outlined in the following sections.

2.1.4.1 Climate

Death from exposure and malnutrition, associated with severe winters, is the most significant natural cause of mortality (Mitchell 1980; Barrett 1982). For example, the estimated mortality for pronghorns entering the severe winter of 1977-78 in Alberta was 48.5 percent (Barrett 1982). Barrett (1982) also stated that fawns and adult males died earlier in the winter than did adult females.

2.1.4.2 Predation

Many researchers have found that predation of newborn pronghorns can be an important limiting factor (Beale and Smith 1973; Bodie 1978; Barrett 1978; Von Gunten 1978; Autenrieth 1980; Neff and Woolsey 1980; Showers Corneli et al. 1984). In Alberta, coyotes (*Canis latrans*) are the major predators of pronghorns, killing about 45 percent of neonates in the first 60 days following parturition. Bobcats take an additional 4.5 percent of fawns for a total predation loss of 50 percent (Barrett 1978, 1982). Golden eagles (*Aquila chrysaetos*) have also been identified as predators of pronghorn fawns in other jurisdictions (Von Gunten 1978). However, Barrett (1982) suggested that fawn predation losses of up to 50 percent annually have not regulated pronghorn numbers or limited the capacity of the population to grow in Alberta.

2.1.4.3 Parasites and Disease

Outbreaks of viral or bacterial infections seem to be uncommon in pronghorns. Evidence of vibriosis, epizootic hemorrhagic disease, bovine virus diarrhea, parainfluenza 3, infectious bovine rhinotracheitis, eastern and western encephalomyelitis, leptospirosis and blue tongue have been found in antelope, but no major mortality from these infections has been reported (Autenrieth 1978). During an outbreak of epizootic hemorrhagic disease in Alberta in 1962, 15 dead pronghorns were found (Chalmers et al. 1964). Mitchell (1980) suggested that parasites and disease were relatively unimportant as causative agents of mortality.

2.1.4.4 Accidental Death

Vehicle collisions on highways and railway tracks may cause the deaths of large numbers of antelope, particularly during periods of deep snow when roads and railways are used as feeding or travel corridors (Mitchell 1980). Pronghorns are occasionally hung up in fences or drown in irrigation canals (particularly the new, smooth concrete canals), but the magnitude of this problem is currently unknown.

2.1.4.5 Hunting

The previous four mortality factors can be termed "natural mortality" where there is no intent by people to remove antelope from the population. Hunting involves the sustained removal of an average of 15 to 20 percent of the preseason population. Illegal harvest and crippling loss have yet to be quantified for pronghorns.

2.1.5 Habitat Requirements and Annual Movements

The following habitat requirements have been established by consensus of pronghorn managers from all western states and provinces and were summarized in Autenrieth (1978) except where noted by separate citation.

Antelope require low rolling terrain with no major physical barriers such as large rivers, lakes, thick brush or trees and mountain ranges. Gently rolling or hilly terrain is preferred for fawning sites. Antelope habitat should receive 250 mm - 380 mm of precipitation annually and snow accumulations should not exceed 25 cm - 30 cm for prolonged periods. Because of a light coloured pelage of hollow hair, antelope can readily survive temperature extremes of -40° to +45°C. At low temperatures, however, wind chill becomes a survival factor particularly for neonates.

Availability of water is important to pronghorns. While some pronghorn populations survive year-round on only the moisture that they extract from succulent forage, most antelope need from 1 L - 4 L of water per day per animal. Distribution of water sources should optimally be no more than 5 km - 6 km apart.

Vegetative community composition is equally important to antelope. Areas preferred by pronghorns are characterized by composition of 40 to 60 percent grass, 10 to 30 percent forbs and 5 to 20 percent shrubs. Within these plant communities, species diversity is also important; the preferred norm is 5-10 grass species, 20-40 forb species and 5-10 shrub species as opposed to monotypic vegetative communities (Yoakum 1978b). Barrett (1982) found that during all seasons 85 to 90 percent of pronghorns were found in native grassland/sagebrush habitat; in summer 70 percent of pronghorns used native prairie. In winter more than 40 percent of antelope were found on land containing sagebrush cover. Range with vegetation 38 cm in average height is preferred by pronghorns; areas with vegetation over 61 cm is used less frequently and little use is made of areas with vegetation over 76 cm in height. Barrett (1982) found that vegetative cover in Alberta is not as important a factor in the selection of pronghorn fawn bedding sites as is the topographic relief.

Winter range is a critical prerequisite for the survival of antelope in Alberta. This includes areas that have adequate supplies of sagebrush (Artemesia cana), a winter staple for pronghorns, and exposure to chinook influences or wind scouring to reduce snow depths. Barrett (1974) found that pronghorns preferred areas with more than 10 sagebrush plants per 60 m of transect. The mean intake of sagebrush per pronghorn was 1.11 kg per day. Other authors (Bayless 1969; Beale and Smith 1970) suggested that browse, predominantly sagebrush, forms more than 90 percent of the winter diet of pronghorns in northern ranges. Mitchell (1980) showed from antelope rumen analysis that pronghorns in southern Alberta consumed 54 percent browse during the winter months. Two Artemesia species, sagebrush and pasture sagewort (A. frigida) constituted 69 percent of the diet during that period. Other shrub species that can be important to the winter survival of pronghorns as shelter during periods of deep snow and cold temperature are trembling aspen (Populus tremuloides), willow (Salix spp.), silverberry (Elaeagnus commutata) and snowberry (Symphoricarpos occidentalis) (Barrett 1982; Mitchell and Smoliak 1971).

Common preferred food species of pronghorns in Alberta are included in Table 1. Mitchell and Smoliak (1971) identified 52 forbs, 12 browse species and an undetermined number of grasses and sedges in rumen samples of Alberta pronghorns.

Soils do not appear to be a limiting factor to pronghorns except on a very localized basis. The saturated soils of slough bottoms, irrigation ditches and intermittent stream beds and lake beds, and the associated grass and forb communities can provide important summer range particularly in years of poor precipitation (Good and Crawford 1978).

Migratory behavior is characteristic of antelope on northern ranges. Pronghorns typically move to wintering areas that represent about 8 percent of the summer range in Alberta (Barrett 1982). Barrett (1982) found that 66 percent of the pronghorns that were observed on normal winter ranges in Alberta during January and early February of 1978 (a severe winter) had moved away from these winter ranges by March to locations where snow depths were reduced. Man-made obstacles can have a significant impact on pronghorns, particularly where winter survival depends on the animals' ability to migrate to areas where forage is more easily obtained. Oakley (1973) identified the problems associated with livestock fences, which impede movement on antelope ranges. As well, pronghorns are sensitive to the presence of roadways or railways, especially where the vehicular activity is irregular (Autenreith 1978). Mitchell (1980) documented the significant mortality of pronghorns due to vehicular and train collisions during the severe winter of 1964. Many animals were killed or injured as they sought the snow-free areas along raised road and rail beds.

2.2 Historical Status, Use and Management of Pronghorn Antelope in Alberta

This section provides a brief overview of the historical status of pronghorn antelope populations and how people used these populations. It also outlines the evolution of pronghorn management programs leading up to the present management program outlined in Section 2.3 of this document.

Table 1. Common forage species[a] of pronghorns (Mitchell 1980; Mitchell and Smoliak 1971).

	Common Name	Scientific Name
Shrubs	sagebrush	*Artemesia cana*
	snowberry	*Symphoricarpos occidentalis*
	silverberry	*Elaeagnus commutata*
	willows	*Salix* spp.
	creeping juniper	*Juniperus horizontalis*
Forbs	pasture sagewort	*Artemesia frigida*
	cushion cactus	*Coryphantha vivipara*
	yellow sweet clover	*Melilotus officinalis*
	wild tomato	*Solanum triflorum*
	yellow goat's-beard	*Tragopogon dubius*
	common knotweed	*Polygonum arenastrum*
	fairy candelabra	*Androsace septentrionolis*
	scarlet butterfly-weed	*Gaura coccinea*
	Colorado rubber-plant	*Hymenoxys richardsonii*
	prickly-pear	*Opuntia polyacantha*
	moss phlox	*Phlox hoodii*
	golden aster	*Heterotheca villosa*
	broomweed	*Gutierrezia sarothrae*
	spiny ironplant	*Happlopappus spinulosus*
	alpine hedysarum	*Hedysarum alpinum*
	everlasting	*Antennaria* sp.
	graceful cinquefoil	*Potentilla gracilis*
	lance-leaved pyrrocoma	*Happlopappus lanceolatus*
	thistles	*Cirsium* spp.
Grasses	common wheat	*Triticum aestivum*
	sedges	*Carex* spp.
	needle and thread	*Stipa comata*
	blue grama	*Bouteloua gracilis*
	June grass	*Koeleria macrantha*
	western wheat grass	*Agropyron smithii*
	Sandberg bluegrass	*Poa sandbergii*

[a] Species nomenclature brought up-to-date (Moss 1983).

2.2.1 Historical Status of Pronghorn Antelope Populations in Alberta

Early explorers reported pronghorns from the Red River in Manitoba to the foothills of the Rocky Mountains (Mitchell 1980). When Lewis and Clark first ventured across the North American prairies in 1804 they observed vast herds of pronghorn antelope (Tsukamoto 1983). Pronghorns were still relatively numerous in Alberta at the beginning of the 20th century, but the severe winter of 1906-07 greatly reduced antelope numbers and eliminated them from much of their former range (Mitchell 1980). In an attempt to establish protected herds of pronghorn for future relocations the Alberta government authorized the capture of wild pronghorns for Banff National Park and the Wainwright Buffalo Park in 1909 and 1910 (OC 358/09; OC 264/10).

Human settlement and illegal shooting caused further reductions in pronghorn numbers until 1913 when hunting of pronghorns was prohibited. This prohibition remained in effect until 1935 (Mitchell 1980). In 1914 the Wawaskesey National Park was established and in the following year the Nemiskam National Park was founded. The purpose of both of these parks was to provide refugia specifically for pronghorns (Lothian 1977). The Alberta government also passed legislation which permitted C. J. Blazier to establish an antelope farm near Lake Newell in 1920. Young pronghorn from Blazier's farm were relocated in Alberta and the United States to replenish wild herds (Mitchell 1980).

An extensive continental pronghorn survey in the early 1920s indicated fewer than 2000 animals in Alberta. A series of mild winters from 1929 to 1934 permitted pronghorn populations to expand at exponential rates and in spite of the dry summers and severe winters of the late thirties, antelope were estimated to number about 30 000 animals in Alberta by 1945 (Wishart 1972). The winter of 1948/49 was characterized by cold temperatures and deep snow accumulations. Pronghorn mortality was extreme and the provincial population estimate plummeted to around 4000 animals. Following the 1949 crash, pronghorn numbers generally increased until 1956. A series of declines and increases was observed in the antelope population following the 1956 levels, until 1964 when the population peaked at 21 000 animals (Mitchell 1980).

The severe winters in 1965, 1966 and 1967 again resulted in high pronghorn mortality and emigration, and poor fawn production. By 1967 there were only about 8500 animals in Alberta. The hunting season was closed in 1969 and when it opened in 1970, a new "trophy" law was in place whereby only male antelope with horns 12.6 cm or more in length could be hunted. A hunting season for females and fawns (non-trophy) was established in 1977 but was closed again in 1978 and 1979. A non-trophy antelope hunting season was reopened in 1980 when the provincial population reached 18 500 animals; this hunting season has occurred on an annual basis since. Limited entry hunting seasons and low winter mortality resulted in a dramatic increase in the antelope population. By 1984 there were an estimated 32 000 pronghorns in Alberta. The provincial antelope survey in July 1989 estimated 22 314 animals. Population estimates from 1952 to 1989 are presented in Figure 3; regional and provincial estimates are included in Table A of Appendix I.

2.2.2 Historical Uses and Management of Pronghorn Antelope in Alberta

2.2.2.1 User Demand and Harvest

Table 2 summarizes the demand for licences (Number of Applicants), the number of licences recommended (or available) to achieve the harvest goal, and the number of licences actually issued for both trophy and non-trophy antelope from 1963-1989 and archery antelope in 1988 and 1989. The period of ineligibility for application for a licence is also indicated because this makes the demand appear lower than it actually would be if hunters could apply every year. The hunter success rates and estimated harvests appear in Table 3. Although the number of animals harvested has varied widely over the years, the hunter success rates have remained very constant. Harvest data by Antelope Management Area (i.e., hunting area) from 1973 to 1989 are presented in Tables A - H in Appendix II.

2.2.2.2 Licencing, Bag Limits and Hunting Seasons

Antelope management efforts in Alberta have increased since 1949 when an unlimited number of licences were issued for the 4025 km^2 of antelope range that was open to hunting. This occurred at a time when

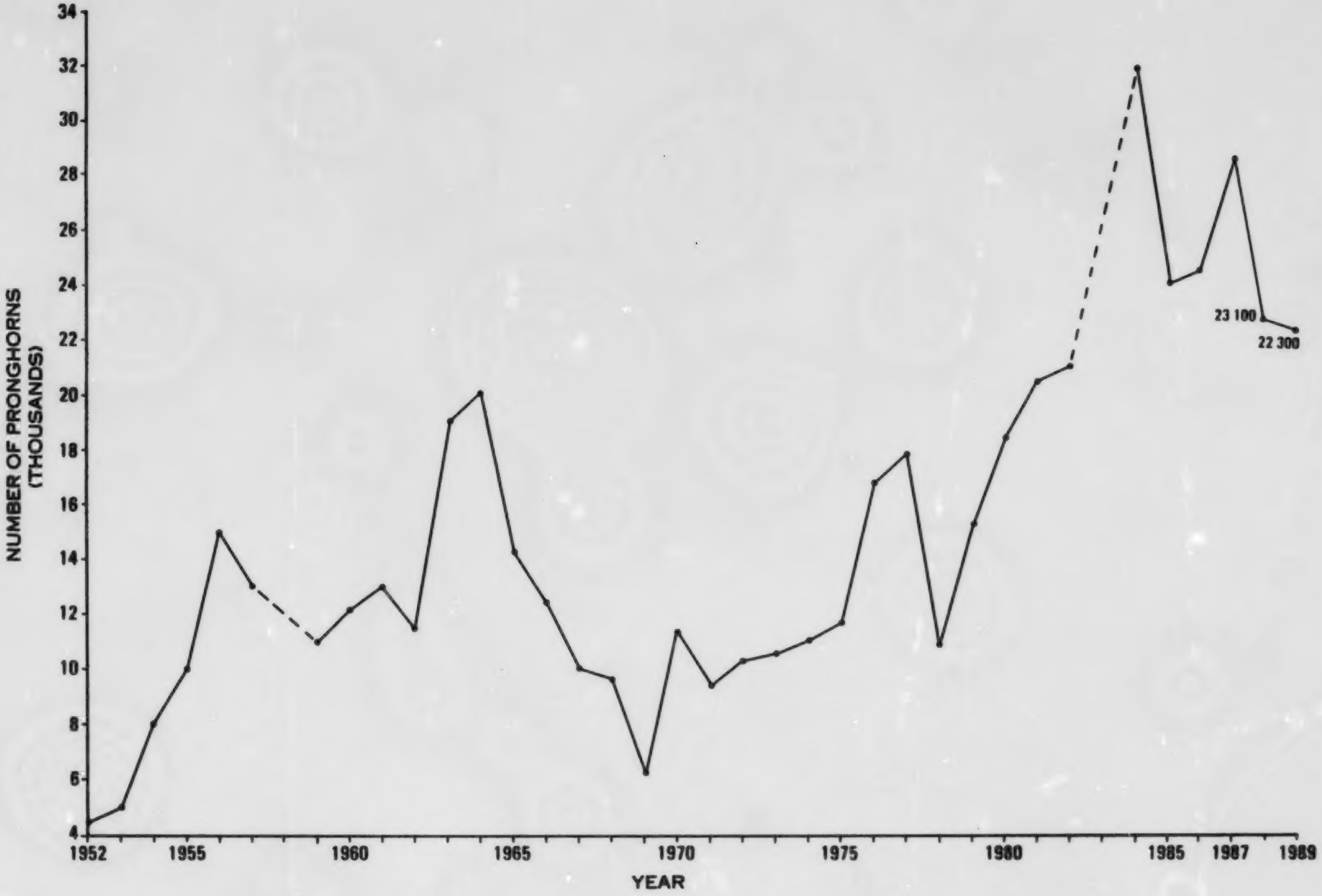

Figure 3. Summer pronghorn populations in Alberta from 1952-1989.

Table 2. Availability, number of applicants and numbers of licences issued for trophy and non-trophy antelope, 1963-1989 and antelope archery in 1988 and 1989.

	Trophy Antelope			Non-Trophy Antelope			Application Ineligibility Period		
							Trophy		Non-Trophy
Year	Number of Licences Available	Number of Applicants	Number Licences Issued	Number of Licences Available	Number of Applicants	Number of Licences Issued	Residents	Non-Residents	Residents Only
1963	3000[a]	NA	3007	NA	NA	NA	None	NA	NA
1964	5750[a]	NA	5255	NA	NA	NA	Nil	NA	NA
1965	4700[a]	NA	4191	NA	NA	NA	Nil	NA	NA
1966	4500[a]	NA	4519	NA	NA	NA	Nil	NA	NA
1967	1000	ND	1004	NA	Closed	-	Nil	NA	NA
1968	2400	ND	2385	NA	Closed	-	Nil	NA	NA
1969	-	Closed	-	-	Closed	-	-	Closed	-
1970	800	ND	798	NA	Closed	-	Nil	NA	NA
1971	1000	ND	1001	NA	Closed	-	Nil	NA	NA
1972	1100	ND	1102	NA	Closed	-	Nil	NA	NA
1973	1075	3150	1080	NA	Closed	-	Nil	NA	NA
1974	1105	4352	1130	NA	Closed	-	Nil	Nil	NA
1975	1440	4264	1474	NA	Closed	-	Nil	Nil	NA
1976	1710	4579	1722	-	Closed	-	1 Yr.	1 Yr.	NA
1977	1835	3302	1848	870	2356	873	1 Yr.	1 Yr.	
1978	1055	8870	1006	-	Closed	-	1 Yr.	1 Yr.	NA
1979	1200	6531	1159	-	Closed	-	1 Yr.	1 Yr.	NA
1980	1700	5943	572	1050	2425	919	1 Yr.	1 Yr.	1 Yr.

Continued...

Table 2. continued...

Year	Trophy Antelope			Non-Trophy Antelope			Application Ineligibility Period		
							Trophy		Non-Trophy
	Number of Licences Available	Number of Applicants	Number Licences Issued	Number of Licences Available	Number of Applicants	Number of Licences Issued	Residents	Non-Residents	Residents Only
1981	1971	5473	1909	1485	2186	1346	2 Yr.	2 Yr.	2 Yr.
1982	2155	5603	2028	2000	1941	1443	2 Yr.	2 Yr.	2 Yr.
1983	2755	6428	2680	2300	1860	1564	2 Yr.	2 Yr.	2 Yr.
1984	3800	6716	3738	7495	5581	6625[b]	2 Yr.	2 Yr.	2 Yr.
1985	3305	5126	3209	3022	2277	1946	2 Yr.	2 Yr.	2 Yr.
1986	3250	5943	3167	4320	4668	3670	2 Yr.	2 Yr.	None
1987	3424	3867	3370	7221	7385	6091	2 Yr.	2 Yr.	None
1988	2970	3548	2840	4420	5080	3695	2 Yr.	2 Yr.	None
1989	3020	3738	3003	3010	4543	2446	2 Yr.	2 Yr.	None

[a] General licence season for male or female pronghorns.

[b] Includes 2214 Quota Licences purchased on a first-come, first-served basis.

ND = No Data Available.
NA = Not Applicable.

Year	Archery Antelope			Application Ineligibility Period
	Number of Licences Available	Number of Applicants	Number Licences Issued	Residents Only
1988	300	197	196	None
1989	260	237	230	None

Table 3. Annual licence sales, pronghorn harvest and hunter success, 1963-1989.

Year	Number Licences Sold	Estimated Number Active Hunters	Estimated Number Antelope Harvested	Hunter Success Rates (%)	
				Based on Number Licences Sold	Based on Number Active Hunters
1963	3 007	2 791	2 422	81	87
1964	5 255	5 068	4 308	82	85
1965	4 191	3 866	3 170	76	82
1966	4 519	4 420	3 478	77	79
1967	1 004	No Data	496	49	-
1968	2 385	No Data	955	40	-
1969	Closed	-	-	-	-
1970	798	730	481	60	66
1971	1 001	930	628	63	68
1972	1 102	1 004	665	60	66
1973	1 080	1 044	798	74	76
1974	1 130	1 048	739	65	71
1975	1 474	1 398	1 122	76	80
1976	1 722	1 618	1 260	78	78
1977	2 721	2 449	1 995	73	81
1978	1 006	926	674	67	73
1979	1 159	1 078	914	79	85
1980	2 491	2 303	1 935	78	84
1981	3 255	2 815	2 364	73	84
1982	3 471	3 089	2 640	76	85
1983	4 244	3 774	3 309	78	88
1984	10 363	9 100	6 757	65	74
1985	5 155	4 728	3 950	59	84
1986	6 837	5 969	4 694	69	79
1987	9 461	8 941	7 783	82	87
1988	6 535	5 508	4 433	68	80
1989	5 449	4 769	4 011	74	84
TOTAL	90 815	79 366	65 992	73	81

antelope had already suffered severe winter mortality. A six-year closure of the season was the result of this overharvest (Wishart 1972).

In 1957, a limited number of pronghorn licences was issued on a first-come, first-served basis. In 1964 the Eastern Irrigation District, which had been closed to hunting for the previous three years, was reopened to hunting and licences were issued through a limited entry draw for the seven Antelope Hunting Areas. This practice of selecting a limited number of hunters per hunting area has continued since 1964. Table 4 presents a detailed outline of pronghorn hunting bag limits and seasons from 1907 to 1989.

Pronghorn hunting in Alberta was open to residents only, from 1907 to 1935; licence fees were $5.00. From 1936 to 1949, non-residents were allowed to hunt as well. Resident fees ranged from $3.00 to $6.00 during the latter period, while non-residents paid from $12.50 to $50.00. From 1956 until 1974 only residents could hunt antelope. Fees were $5.00, increasing to $7.50 in 1966 and $10.00 in 1970.

In 1967, a priority selection system was initiated for resident antelope hunters. A colored card was returned with all unsuccessful applications. These cards were to be submitted in 1968 with the application forms for antelope licences, so those applicants could be given selection priority. However, there were problems with hunters retaining their cards until the 1968 hunting season, and following the 1969 antelope season closure, the system was dropped. Non-residents were again allowed to hunt trophy antelope from 1975 to 1979. Fees were $10.00 for residents and $25.00 for non-residents. A regulation amendment was also passed in 1975 which applied tq the 1976 hunting season. Anyone holding a trophy antelope licence in any year was ineligible to apply for a trophy antelope licence the following year.

In 1980, a non-trophy antelope (any antelope with horns 7.6 cm or less in length) season was established for residents with a licence fee of $10.00. The resident trophy antelope licence was raised to $20.00 and the non-resident trophy antelope licence fee was increased to $125.00.

In 1981, a two-year wait-out period before re-application for any antelope licence was applied to anyone holding either a trophy or non-trophy antelope licence. This change was motivated by demand for

Table 4. History of pronghorn hunting in Alberta, 1907-1989.

Year[a]	Season Dates	Season Type	Season Duration (Days)	Bag Limit
1907-1912		General	3	
1913	Oct. 1 - Nov. 1	General	28	
1914-1933	Closed	-		
1934	No Season			
1935	Nov. 1-11	General	9	2-Either Sex
	Dec. 2-10	"	8	1-Male Only
	Jan. 1-12	"	10	1-Male Only
1936	Oct. 5-21	"	15	2-Either Sex
1937	Oct. 5-21	"	15	2-1 Must Be Male
1938	Oct. 10-29	"	18	1-Either Sex
1939	Closed			
1940	Oct. 15-30 (Eastern Irrigation Dist. -EID-Closed)	General	14	1-Either Sex
1941	Oct. 20-Nov. 1	General	12	2-Either Sex
1942	Oct. 15-31	"	14	1-Male
	Nov. 4-14	"	10	2-Males
1943	Oct. 18-30	"	12	1-Either Sex
1944	Oct. 23-Nov. 11	"	18	1-Either Sex
1945	Oct. 22-Nov. 10	"	18	1-Either Sex
1946	Oct. 21-Nov. 9	"	18	1-Either Sex
1947	Closed			
1948	Oct. 25-Nov. 6	General	12	1-Either Sex
1949	Oct. 24-Nov. 5	"	12	1-Either Sex
1950-1955	Closed			
1956	Nov. 23-30	General	6	1-Either Sex
1957	Nov. 1-9	Limited General Lic.	8	1-Either Sex
1958	Nov. 1-8	Limited Entry Draw (LED)	7	1-Either Sex
1959	Closed			

(continued)

Table 4 (Continued)

Year[a]	Season Dates	Season Type	Season Duration (Days)	Bag Limit
1960	Nov. 7-12	LED	6	1-Either Sex
1961	Nov. 6-11	"	6	1-Either Sex
1962	Nov. 10-17	"	7	1-Either Sex
1963	Oct. 25-Nov. 2	"	7	1-Either Sex
1964	Oct. 24-31	LED - 7 Areas	7	1-Either Sex
	(EID Opened)			E.I.D. Opened
1965	Oct. 23-30	"	7	1-Either Sex
1966	Oct. 22-29	"	7	1-Either Sex
1967	Oct. 21-28	"	7	1-Male Only
1968[a]	Oct. 22-29	"	7	1-Male Only
1969	Closed			
1970	Oct. 24-31	"	7	1-Trophy
1971	Oct. 25-30	"	6	1-Trophy
1972	Oct. 23-28	"	6	1-Trophy
1973	Oct. 22-27	"	6	1-Trophy
1974	Oct. 21-26	"	6	1-Trophy
1975	Oct. 20-25	"	6	1-Trophy
1976	Oct. 25-30	"	6	1-Trophy
1977	Oct. 17-22	"	6	1-Trophy
	Oct. 20-22	"	3	1-Non-Trophy
1978	Oct. 23-28	"	6	1-Trophy
1979	Oct. 22-27	"	6	1-Trophy
1980	Oct. 27-Nov. 1	"	6	1-Trophy
	Oct. 30-Nov. 1	"	3	1-Non-Trophy
1981	Oct. 26-31	"	6	1-Trophy
	Oct. 29-31	"	3	1-Non-Trophy
1982	Oct. 25-30	"	6	1-Trophy
	Oct. 28-30	"	3	1-Non-Trophy
1983	Oct. 24-29	"	6	1-Trophy
	Oct. 27-29	"	3	1-Non-Trophy

(continued)

Table 4 (Continued)

Year[a]	Season Dates	Season Type	Season Duration (Days)	Bag Limit
1984	Oct. 22-27	LED - 8 Areas	6	1-Trophy
	Oct. 25-27	"	3	1-Non-Trophy
	Oct. 29-31	"	3	1-Non-Trophy
1985	Oct. 14-19	LED - 8 Areas (Bow Only)	6	1-Licenced for either Trophy or Non-Trophy
	Oct. 21-26	LED - 8 Areas	6	1-Trophy
	Oct. 24-26	"	3	1-Non-Trophy
1986	Oct. 13-18	LED - 8 Areas (Bow Only)	6	1-Licenced for either Trophy or Non-Trophy
	Oct. 20-25	LED - 8 Areas	6	1-Trophy
	Oct. 23-25	"	3	1-Non-Trophy
1987	Oct. 12-17	LED - 8 Areas (Bow Only)	6	1-Licenced for either Trophy
	Oct. 19-24	LED - 8 Areas	6	1-Trophy
	Oct. 22-24 or Oct. 26-28	"	3	1-Non-Trophy
1988	Sept.19-Oct.1 or Oct.3-15	LED - 8 Areas (Bow Only)	13	1-Any Antelope
	Oct.3-8 or Oct. 17-22	LED - 8 Areas	6	1-Trophy
	Oct. 6-8, 13-15, 20-22, or 24-26	"	3	1-Non-Trophy
1989	Sept.18-30	LED - 8 Areas (Bow Only)	13	1-Any Antelope
	Oct.2-7 or Oct.16-21	LED - 8 Areas	6	1-Trophy
	Oct.5-7, 12-14, 19-21 or 23-25	"	3	1-Non-Trophy

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[a] 1907-1968 data from Mitchell (1980).

antelope licences that was consistently higher than the number of available licences, and by complaints from unsuccessful licence applicants. This waiting period was rescinded for non-trophy antelope licence holders in 1986 in order to reduce the annual undersubscription that had developed for non-trophy antelope licences. After this anyone could apply for a non-trophy antelope licence on an annual basis.

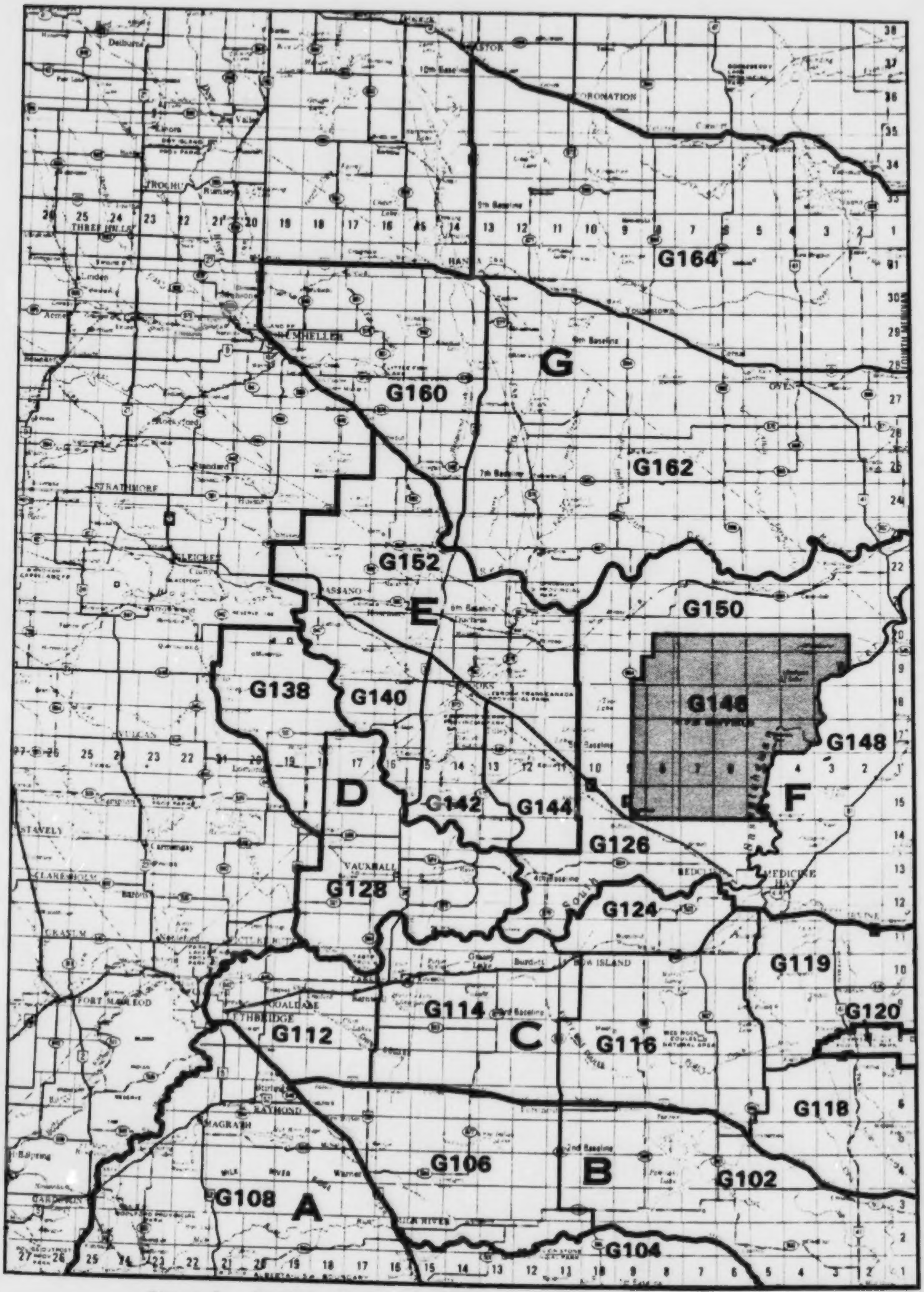
In 1987, the resident licence fee was raised to $40.00 and the non-resident fee was raised to #138.00. Additional time periods were added for non-trophy seasons to spread the hunting pressure out over more days. However, an individual hunter was still licenced for only three days.

In 1988, a limited entry antelope archery special licence was added. This allowed archers to take any antelope and was a separate licence from trophy and non-trophy. Hunters could apply for all three licences (if they met the trophy eligibility requirement) but could possess only one licence. The draw order was archery, trophy and non-trophy. Those selected in any draw were then not eligible for subsequent draws.

2.2.2.3 Population Inventory

Systematic aerial censusing of pronghorns began in 1955. Mitchell (1980) reported that initially 0.8 km strips on either side of a line transect were searched in late July or early August. Fawns and adult antelope observed per transect were recorded and the sex of adults was determined. Sampling was concentrated in the Pakowki, Newell, Aden and Ronalane areas, with an initial coverage of 3 percent in 1955 and 1956 and 100 percent coverage of the Lake Newell and Pakowki site between 1959 and 1964. In 1963, twelve sets of straight line transects were surveyed in representative sections of continuous antelope range from Lethbridge east to the Saskatchewan border and from the Montana border north to the Red Deer River (Webb 1963). From 1963 to 1969, provincial antelope surveys covered one third of the antelope range annually at 50 percent coverage (Barrett and Vriend 1980).

In 1964, the province was subdivided into 134 Wildlife Management Units (WMUs). At the same time, 20 WMUs in southeastern Alberta were grouped into seven Antelope Hunting Areas (Figure 4), including the



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BASSANO
BROOKS
VAUXHALL
MEDICINE HAT
BOW ISLAND
FORT MACLEOD
LETHBRIDGE
COALDALE
RAYMOND
MAGRATH
MILK RIVER
CLARESHOLM
STAVELY
OYEN

Figure 4. Antelope Hunting Areas (letters A - G) from 1964 to 1983.

Eastern Irrigation District, which had been closed to hunting for the previous three years.

In 1970 and 1971, a standardized format was adopted to sample 18 percent of the total antelope range in the province. Representative habitat types were flown at 50 percent coverage for intensive pronghorn use areas and at 25 percent coverage for marginal habitat. Sixteen permanent sampling blocks were established in which 38.6 km long transects were flown at 3.22 km intervals. The Suffield Military Block was also surveyed in the same manner but the data were not used in provincial population estimates.

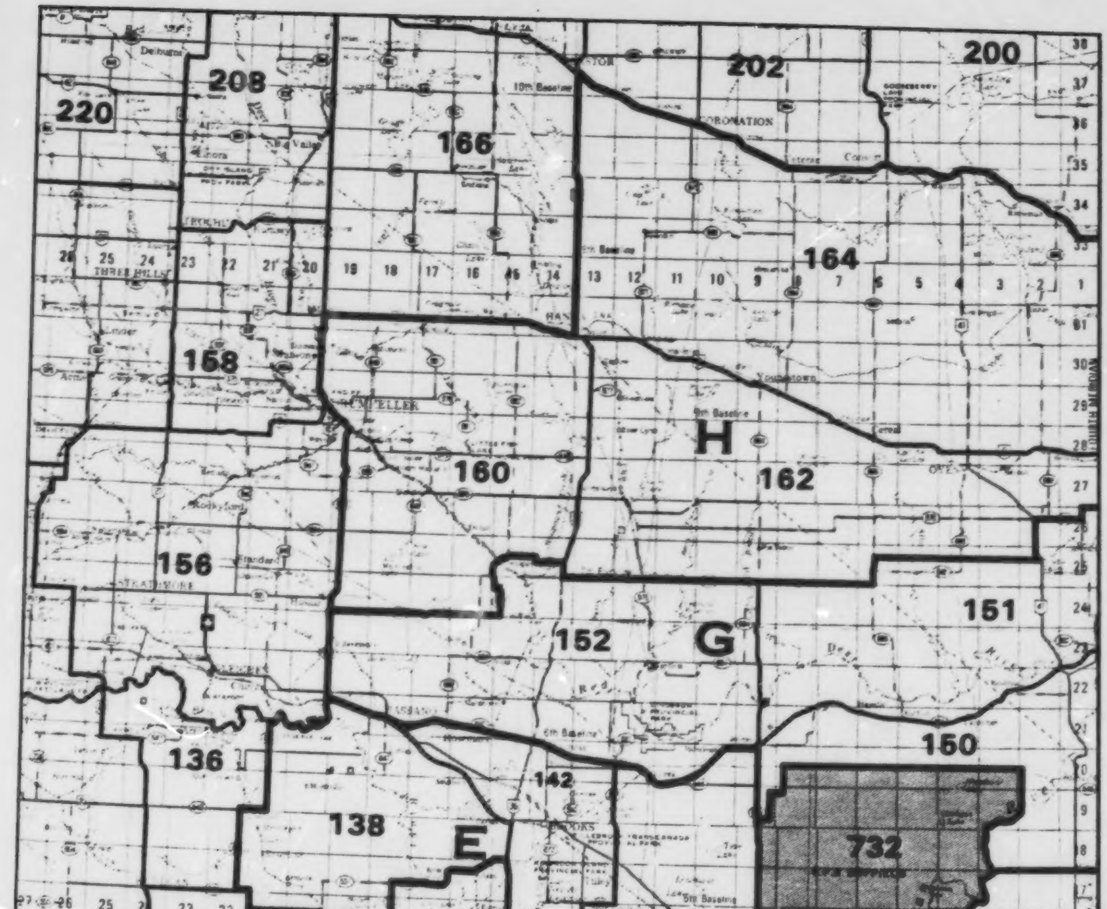
A provincial survey team was established in 1971 to provide more consistency to the data collection process. This survey team functioned until 1981 when the responsibility for aerial surveys was shifted to the regional biologists in Lethbridge and Red Deer. Survey design and operation for the period of 1970-1981 are reviewed in Cook (1981).

In 1984, WMU boundaries were adjusted in southeastern Alberta to reflect habitat use by individual overwintering herds of pronghorns. Area G north of the Red Deer River (Figure 4) was split to create an additional hunting area, Area H, and provide more recreational opportunity by more effectively distributing hunters and the antelope harvest. These eight areas have been known as Antelope Management Areas (Figure 5) since 1984. Survey blocks were added or altered in management areas B, D, E, F, G and H to increase survey coverage and to equalize sampling intensity among the eight management areas. Beginning in 1986, the survey was cut back to cover four Antelope Management Areas each year.

Transects 0.8 km in width were flown in 1984 at 3.22 km, 6.44 km and 9.66 km intervals. This provided 25 to 50 percent block coverage. Aerial flights were scheduled at 0600 hours and 1600 hours and small fixed wing aircraft were used to classify all animals both on and off transect. Survey transects were flown at 60 m - 90 m above ground level at speeds of 120 km/h -160 km/h.

2.2.2.4 Historical Management Goals, Objectives and Strategies

Alberta pronghorn managers were following certain management regimes as early as the mid-1950s, but the first written management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MAGRATH
RAYMOND
VAUXHALL
FORT MACLEOD
CLARESHOLM
THREE HILLS
BOW ISLAND
REDCLIFF
PICTURE BUTTE
OYEN
IRVINE

Figure 5. Antelope Management Areas (letters A - H) from 1984 to present.

plan, a consensus of the antelope managers at that time, appeared in Wishart (1972). These goals, objectives and strategies were as follows:

"1. Annual population and harvest surveys continued on a sound statistical basis;

2. An optimum population goal for the province set at approximately 15 000 antelope (excluding the Suffield Reserve), after which a maximum sustained harvest should be taken;

3. A lower limit of 5000 antelope (excluding Suffield) established below which the season will be closed;

4. Lands sufficient to support an optimum wintering population of antelope, reserved and managed for this purpose;

5. Migration patterns within the province, as well as interprovincial and international movements established by a trapping and marking program;

6. A high quality hunting experience while in pursuit of antelope maintained by not exceeding a density of one hunter per four square miles;

7. A high quality animal will be provided by closing the trophy season not later than the last week of October."

They still form the basis of the current management program.

2.3 Current Status, Use and Management of Pronghorn Antelope in Alberta

The previous section outlines what is known about the historical status and use of antelope populations and habitat. It also discusses the development of antelope management during the same period. The purpose of this section is to provide a detailed description of the current status of antelope populations and habitat, the present level and distribution of people's use of the resource and the present management program.

2.3.1 Current Status of Pronghorn Antelope Populations in Alberta

The estimated pronghorn antelope population in Alberta in July 1989 was 22 300. This ranks the province as first in Canada in terms of total numbers and sixth in North America behind Wyoming (315 000), Montana (160 000), South Dakota (65 000), Colorado (47 250) and New Mexico (30 000). Table 5 displays the population estimates for each Antelope Management Area and also provides buck:doe ratios and production information (fawn:doe ratios).

The estimated July 1989 population of 22 300 antelope (Table 5) in the eight Antelope Management Areas (A-H) is lower than the July 1988 estimate of 23 100. Antelope populations can change rapidly from year to year but the overall trend in the last 10 years has been towards higher populations (Appendix I). Figure 6 illustrates the average density of pronghorns by WMU for the period 1963 - 1985. The best pronghorn densities are associated with uncultivated short grass prairie in units 102, 104, 108, 118, 119, 124, 128, 142, 144, 148 and 732 (Suffield). Generally, where cultivation has been intensive (106, 112) or where winter mortality can be high at the northern extension of pronghorn range in Alberta (151, 152, 160, 162, 164 and 166), antelope densities have averaged less than 0.31 animals per km^2.

The 1989 provincial buck:doe ratio of 59:100 in the four antelope hunting areas surveyed is higher than the 1963-1989 average of 48:100 (Table 6). Comparison reveals most 1989 hunting area buck:doe ratios were below the long-term average. Suffield, which has a largely unhunted population, had a buck:doe ratio of 50:100 in 1989. Reference to Table 6 shows that the Suffield ratio has been much higher than the provincial average from 1963-1989.

Production, reflected in the 1989 fawn:doe ratio of 39:100, is well below to the long-term average (Table 6). More detailed buck:doe:fawn ratios and information on antelope densities by hunting area from 1963-1989 can be found in Appendix III.

Table 5. Estimated pronghorn antelope populations and buck:doe:fawn ratios in Alberta in July 1989.

Antelope Management Area	Estimated Number Animals	Percent of Provincial Population	Number Bucks Per 100 Does	Number Fawns Per 100 Does
A	1 600	7	48[a]	55[a]
B	700	3	47[b]	36[b]
C	4 200	19	51	28
D	950	4	96	71
E	2 420	11	66	51
F	4 600	21	39[a]	47[a]
G	2 330	10	62	52
H	2 500	11	55[a]	72[a]
Suffield	3 000	14	50[c]	50[c]
Total	22 300	100	41[d]	62[d]

[a] 1988 data were used as these areas were not surveyed in 1989.

[b] 1985 data were used as this area was not surveyed in recent years.

[c] 1986 data were used as this area was not surveyed in recent years.

[d] This ratio reflects only the 1989 data from areas C, D, E and G.

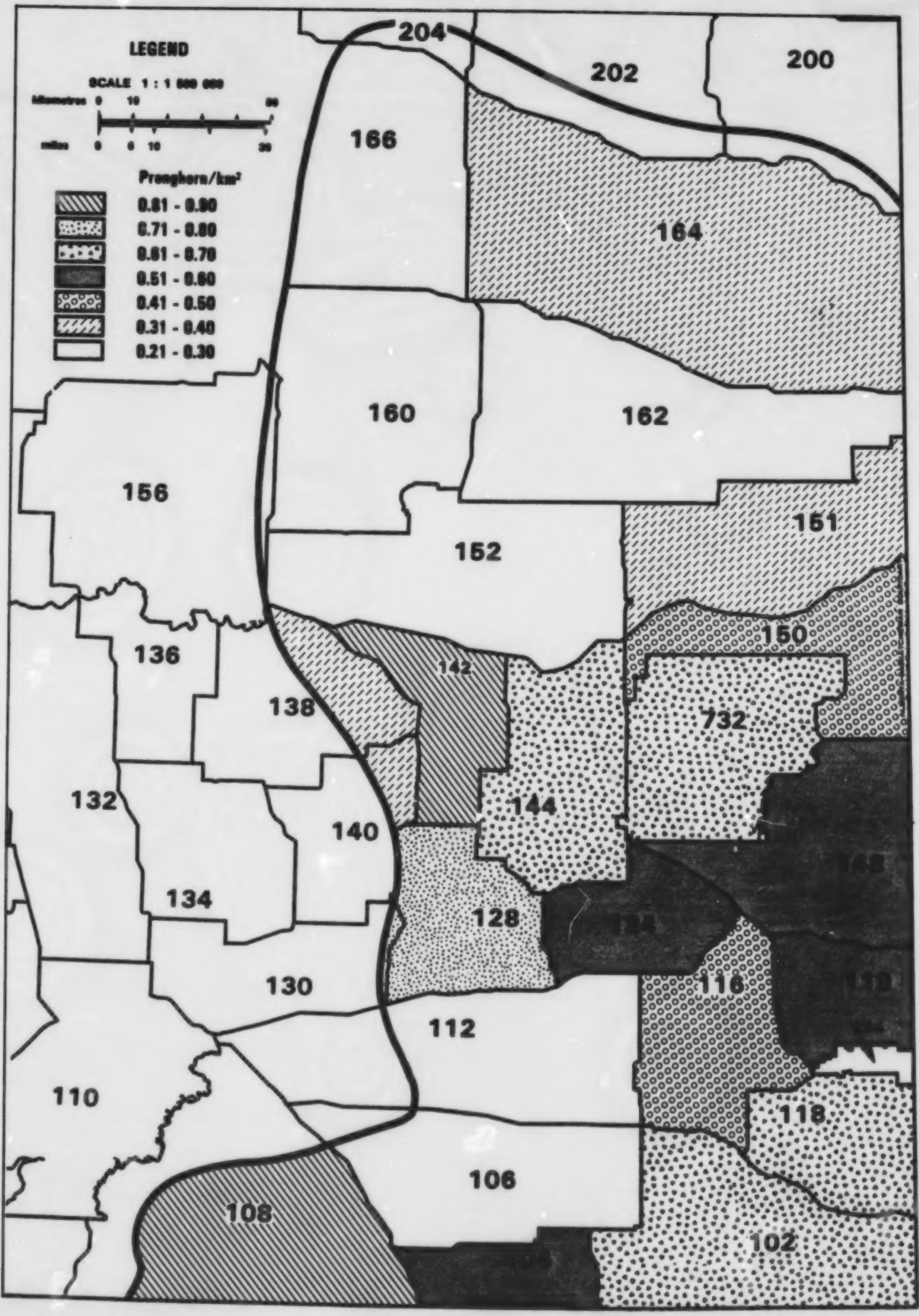
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Figure 6. Average densities of pronghorns from 1963 - 1985 by Wildlife Management Unit.

Table 6. Comparison between the 1989 buck:doe:fawn ratios and the 1963-1989 average.

Antelope Management Area	Bucks Per 100 Does		Fawns Per 100 Does	
	1989 Estimate	1963-1989 Average	1989 Estimate	1963-1989 Average
A	48[a]	46	55[a]	70
B	47[b]	38	36[b]	54
C	51	45	28	47
D	96	57	71	73
E	66	48	51	73
F	39[a]	43	47[a]	62
G	62	39	52	62
H	55[a]	50	72[a]	60
Suffield	50[c]	65	50[c]	62
Total	59[b]	48	39[d]	62

[a] 1988 data were used as these areas were not surveyed in 1989.

[b] 1985 data was used as this area was not surveyed recently.

[c] 1986 data was used as this area was not surveyed recently.

2.3.2 History and Current Status of Pronghorn Antelope Habitat in Alberta

Initial European settlement on the prairies fostered cattle husbandry since the low precipitation, strong winds and large climatic moisture deficit made crop production a high risk. With the advent of irrigation, however, intensive cultivation of the brown Chernozemic soils permitted the production of sugar beets, alfalfa, vegetable crops, wheat, oats and barley. Natural prairie has been plowed and competition for forage with cattle on the remaining range has become significant. Range fencing, which is associated with cattle production, has become more prevalent.

From 1961 to 1976 there was a 17 percent decline in the number of farms in the Medicine Hat, Taber, Lethbridge areas of southern Alberta. During the same period, however, there was a 4.5 percent increase in farmland and an 8 percent increase in cultivated acreage (McCuaig and Manning 1982).

Haag (1986) estimated the total Alberta antelope range, including cultivated land and native grass prairie, to be 52 829 km^2. He found that during the period 1970 to 1983 cultivated lands on pronghorn range increased from 1 569 678 ha (29.7 percent of the total range) to 1 881 047 ha (35.6 percent of the total range), an increase of 19.9 percent in the amount of cultivated land. The 312 005 hectares converted to cultivation, 5.9 percent of the total range, represents a loss of 8.4 percent of the native grass prairie. He noted that the major increase in cultivation was in the northern part of the range.

Clark (1985) excluded some of the predominately cultivated area included by Haag (1986); consequently, he determined a total Alberta antelope range of 43 588 km^2 (71 percent or 30 812 km^2 of native grass prairie and 29 percent or 12 776 km^2 of cultivated land). Table 7 provides a summary of the area of native grass prairie and cultivated land in each of the Antelope Management Areas as calculated by Clark (1985). Barrett and Vriend (1980) identified 12 pronghorn winter ranges from the Red Deer River and south which totalled 3423 km^2 excluding the Suffield Military Reserve. These winter ranges are shown within current WMU boundaries (Figure 7) and Table 8 indicates the amount of winter

Table 7. Amount of native grass prairie and cultivated land in each Antelope Management Area in 1985.

Antelope Management Area	Native Grass Prairie		Cultivation		Total Area (km^2)
	Area (km^2)	% Total Area	Area (km^2)	% Total Area	
A	1 380	74	474	26	1 854
B	1 445	24	4 501	76	5 946
C	4 522	91	422	9	4 944
D	945	70	399	30	1 344
E	2 761	92	246	8	3 007
F	5 196	70	2 253	30	7 449
G	6 283	79	1 650	21	7 933
H	8 280	75	2 831	25	11 111
Total	30 812	71	12 776	29	43 588

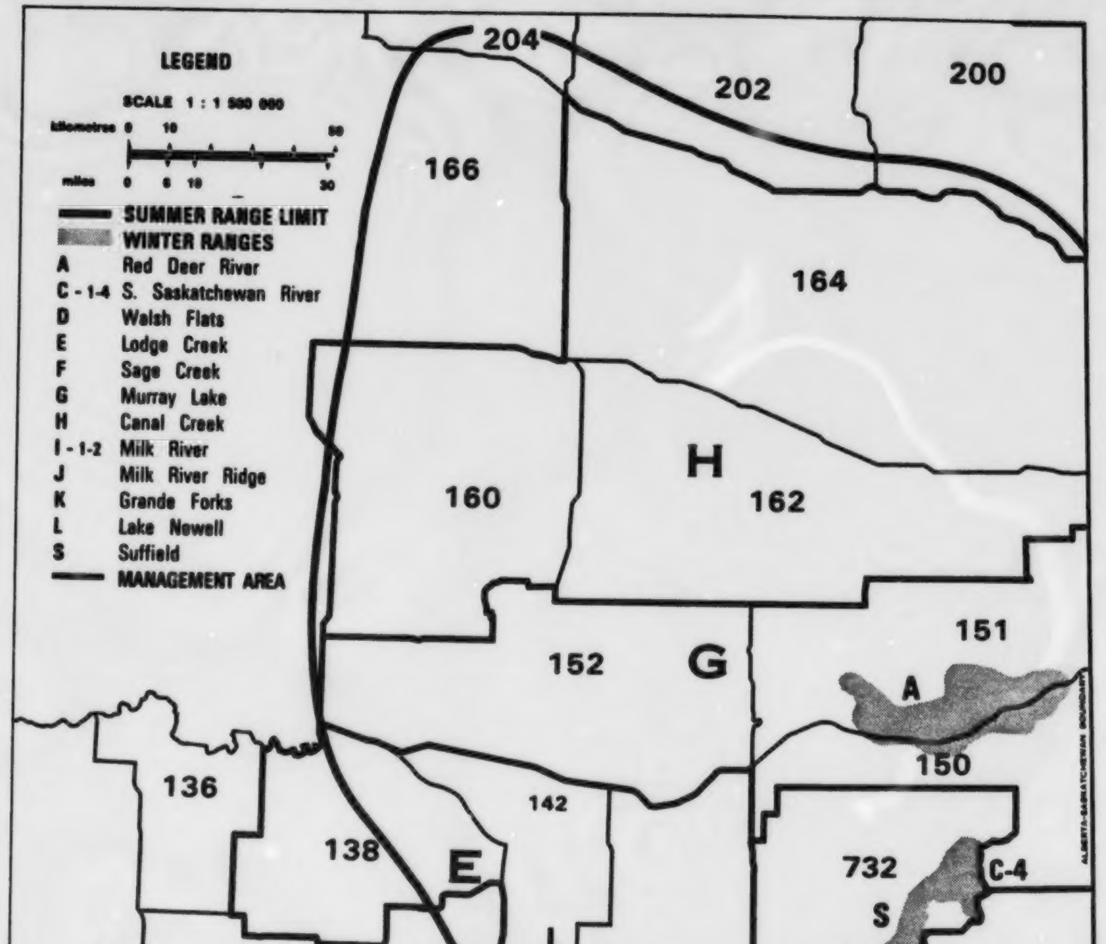
LEGEND
SCALE 1 : 1 500 000
kilometres 0 10 50
miles 0 5 10 30
SUMMER RANGE LIMIT
WINTER RANGES
A Red Deer River
C - 1-4 S. Saskatchewan River
D Walsh Flats
E Lodge Creek
F Sage Creek
G Murray Lake
H Canal Creek
I - 1-2 Milk River
J Milk River Ridge
K Grande Forks
L Lake Newell
S Suffield
MANAGEMENT AREA
204
202
200
166
164
H
160
162
151
152
G
A
150
136
142
138
E
732
C-4
S
L
132
144
C-3
140
D
C-2
148
134
C-1
128
124
D
K
F
130
116
119
G
112
624
B
110
118
E
H
106
C
108A
J
102
F
I-2
104
I-1
ALBERTA-SASKATCHEWAN BOUNDARY
ALBERTA-U.S.A. BOUNDARY

Figure 7. Known winter ranges for pronghorns in Alberta.

Table 8. Areas of pronghorn winter ranges in Alberta in 1975.

Antelope Management Area	Winter Range Letters (see Fig. 7)	Area (km^2)
A	J	387
B	Nil	Nil
C	I_1, I_2, E, F, H	1089
D	K	244
E	L	224
F	C_1, C_2, C_3, C_4, D, G	1040
G	A	439
H	Nil	Nil
Total		3423[a]

[a] Of 3423 km^2 of delineated winter range, 3027 km^2 were used by pronghorn on a consistent basis.

range by Antelope Management Area.

Glaholt (1984) found that during the period 1950 to 1983 cultivated lands on these winter ranges increased from 9.7 percent of the winter range to 14.4 percent, an increase of 48 percent in the amount of cultivated land. The 13 721 ha converted to cultivation, 4.7 percent of the winter range, represent a loss of 5.2 percent of the native grass prairie. Kemp (1983), upon investigating the Walsh Flats winter range, noted an increase in cultivation from 15 to 22 percent of the winter range, very similar to Glaholt's 16 to 23 percent on this particular range.

2.3.3 Current Uses of Pronghorn Antelope in Alberta

Current uses of pronghorn antelope in Alberta include recreational hunting, aesthetic enjoyment, scientific research, education and commercial opportunities.

2.3.3.1 Recreational Hunting

Pronghorn antelope are hunted under the authority of a special licence obtained through a draw that limits the number of hunters in each Antelope Management Area or hunting area. Hunters may possess an Antelope Archery Special Licence, a Trophy Antelope Special Licence or a Non-trophy Antelope Special Licence. A hunter may apply for archery and non-trophy every year, but those successful in the draw for a trophy licence may not apply during the following two years. Non-resident Canadians may apply for a Trophy Antelope Special Licence, and non-residents and non-resident aliens may obtain a Trophy Antelope Special Licence through an outfitter-guide allocation. Non-trophy licences are available only to residents.

The hunting season is usually three to four weeks in September for archery, one week in October for trophy antelope and three to six days for non-trophy antelope. The non-trophy season starts later than the trophy season and may include more than one 3-day season to reach the harvest goal. An archery season is provided prior to the rifle season. Trophy licences are in much greater demand than non-trophy, partly because of tradition and partly because the antelope carcass produces very little meat compared to other ungulates.

Table 9 portrays the demand (number of applicants) and the amount of recreation provided (number of licences issued, recreation days provided and animals harvested) in 1989. Comparison of the provincial total in Table 9 with those in Table 2 (page 15) indicates that the demand for antelope licences increased to a very high level, particularly when the one- and two-year ineligibility periods for trophy licence applications are considered.

Hunter residence codes are shown in Figure 8 while Table 10 indicates antelope hunter distribution by residence code from 1980-1984, the most recent data available. Hunters originate from all over Alberta, but the highest percentage reside in the areas of the residence codes for Calgary, Edmonton and the two codes that encompass antelope range (5 and 6). Rough calculations from the approximate centre of each residence code's populated area to the centre of the hunting areas indicates the average distance travelled is about 220 km one-way to hunt antelope.

Non-resident use involved 90 licences in 1989 with the majority from British Columbia. Harvest success rates were not measured but would likely be similar to residents.

2.3.3.2 Nonconsumptive Use

Phillips et al. (1977a) determined that 1.4 million Albertans (79 of the provincial population) were involved in nonconsumptive wildlife recreational activities such as observation, photography and study during 1975-76, providing 17 million days of recreation. Assuming the same level of involvement in 1989, the figures would be 1.9 million people and 22 million recreation days. The study did not break down nonconsumptive recreational activities but animal life enjoyment accounted for 40 percent of the activity. Antelope were listed as twelfth in the "like to see" species category and third in the "like to see more of" category of a survey of nonconsumptive Alberta recreationists (Phillips et al. 1977a). Pronghorns ranked second of 11 mammalian game species for which Albertans, involved in nonconsumptive use, would like to see increased populations. Filion et al. (1989) found that 2.2 million (91 percent) Albertans participated in a wide range of nonconsumptive wildlife-related activities, providing more than

Table 9. Pronghorn antelope licence demand, recreation provided and hunter success in Alberta in 1989.

Antelope Management Area	Special Licence Type	Number of Applicants	Number Licences Issued	Number Recreation Days Provided[a]	Number Animals Harvested[a]	Hunter Success Rate(%)[a]
A	Archery	11	11	-	-	-
	Trophy	273	268	480	150	56
	Non-Trophy	225	211	203	118	56
B	Archery	21	21	-	-	-
	Trophy	203	121	178	78	64
	Non-Trophy	188	139	170	110	79
C	Archery	38	36	-	-	-
	Trophy	712	601	1229	517	86
	Non-Trophy	725	686	572	353	51
D	Archery	17	17	-	-	-
	Trophy	236	121	242	106	88
	Non-Trophy	272	30	45	19	63
E	Archery	22	21	-	-	-
	Trophy	409	381	681	336	88
	Non-Trophy	492	31	43	21	68
F	Archery	33	33	-	-	-
	Trophy	673	591	1198	443	75
	Non-Trophy	830	499	581	381	76
G	Archery	67	66	-	-	-
	Trophy	752	496	861	472	95
	Non-Trophy	1006	290	483	258	89
H	Archery	28	25	-	-	-
	Trophy	480	393	600	378	96
	Non-Trophy	805	539	488	281	52
Total	Archery	237	230	758	63	27
	Trophy	3738	2972	5469	2480	83
	Non-Trophy	4543	2425	2585	1541	64
	Total	8518	5627	8812	4084	73

[a] The small sample of archers contacted during the telephone harvest survey precluded analysis of the data at the Antelope Management Area level; therefore, only totals are provided for the archery licence type.

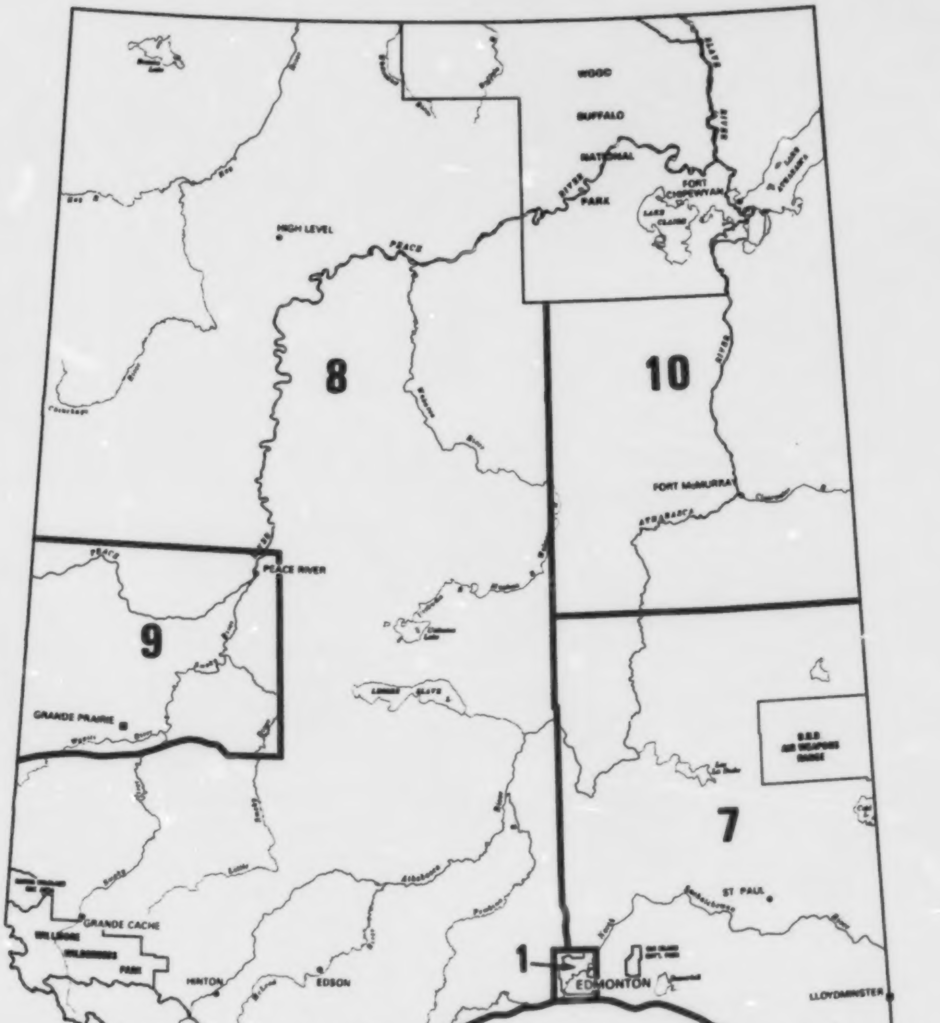
WOOD
BUFFALO
NATIONAL
PARK
FORT CHIPEWYAN
HIGH LEVEL
PEACE
8
10
FORT McMURRAY
PEACE RIVER
9
GRANDE PRAIRIE
7
ST PAUL
GRANDE CACHE
HINTON
EDSON
1
EDMONTON
LLOYDMINSTER
CAMROSE
WETASKIWIN
JASPER
JASPER NATIONAL PARK
2
RED DEER
6
BANFF NATIONAL PARK
BANFF
DRUMHELLER
3
CALGARY
5
MEDICINE HAT
COLEMAN
BLAIRMORE
LETHBRIDGE
4

Figure 8.
Residence code for resident hunting licence sales in Alberta.

Table 10. Antelope hunter distribution by residence code, 1980-1984.

	Number of Trophy Hunters by Residence Code										
Year	1	2	3	4	5	6	7	8	9	10	Total
1980	188	33	321	89	387	414	54	47	14	5	1 552
1981	277	39	448	105	460	364	80	72	26	12	1 883
1982	217	30	427	126	555	452	75	89	11	13	1 995
1983	332	65	609	126	680	553	114	115	17	11	2 622
1984	477	66	829	208	803	857	183	164	35	28	3 650
Total	1 491	233	2 634	654	2 885	2 640	506	487	103	69	11 702
Mean	298	47	527	131	577	528	101	97	21	14	2 340

	Number of Non-Trophy Hunters by Residence Code										
Year	1	2	3	4	5	6	7	8	9	10	Total
1980	115	28	210	60	222	217	54	47	14	5	923
1981	193	35	298	54	261	378	80	72	26	12	1 346
1982	244	51	386	48	218	363	75	89	11	13	1 442
1983	199	44	448	74	256	398	114	115	17	11	1 564
1984	615	147	1 134	187	622	1 284	183	164	35	28	4 406
Total	1 366	305	2 476	423	1 579	2 640	506	487	103	69	9 681
Mean	273	61	495	85	316	528	101	97	21	14	1 936

130 million days of recreation in 1987. The study did not specify the level of activity attributed to pronghorns.

2.3.3.3 Research

Pronghorn antelope research has been conducted mainly by universities and the Fish and Wildlife Division in Alberta. Past studies have focused on behavior, habitat use, fawn predation and survival, winter survival, movements and range improvement techniques. Pronghorns are an excellent educational study of a species adapted to live in the dry prairie area of Alberta.

2.3.3.4 Commercial Uses

There is currently very little commercial use made of pronghorns. A few animals are present in zoos for display purposes. Although data are not tabulated, Fish and Wildlife staff felt most of the 50-100 non-residents that came to hunt antelope historically, did so while accompanying a resident rather than a commercial guide. There was an allocation of 4 percent of the trophy antelope harvest for non-residents/non-resident aliens accompanying a commercial guide in 1990.

2.3.4 The Value of Pronghorn Antelope to Albertans

The previous section on current uses of pronghorns in Alberta indicated a high demand for a limited resource which occurs in the prairie area of Alberta. This high demand and the hundreds of thousands recreation days provided through both consumptive and nonconsumptive use can be translated into a dollar value for the Alberta economy. This section will outline some of the positive dollar benefits and briefly discuss costs associated with antelope damage.

Phillips et al. (1977b) referred to market benefits (licence fees, cost of fuel, food, lodging, ammunition, capital expenditures) and extra-market benefits in determining the value of the wildlife resource to resident hunters. Extra-market benefits were defined as the value of hunting activity over and above hunting costs. They determined that the market benefits excluding licence fees was $343.23 per big game hunter per season ($153.36 in variable costs and $189.97 in capital costs). In addition, the extra-market benefits amounted to $200.85 per person per season. Each hunter took an average of 4.5 trips to spend a personal total of $544.08 or a mean of $120.91 per trip (adjusted using the consumer price index change from 1975 to 1989 of 2.579 the cost per trip in 1989 would be $311.83 per trip). Assuming the same cost ratio in 1989, antelope hunting, usually one trip, would have generated a total of $1.75 million in benefits ($311.83 X 5627 hunters). Non-residents held only 90 licences in 1989 so their contribution was relatively small.

Mature male pronghorns in Alberta ranged from 24 kg - 35 kg (mean = 30.3 kg) dressed weight while mature females weighed from 22 kg - 30 kg (mean = 25.8 kg). Dressed weight is defined as the carcass with head, skin and viscera removed. Kid weights ranged from 16.8 kg - 20.4 kg with a mean of 18.75 kg (Mitchell 1980). The current dressed weight of beef averages about $3 per kg. This would give an approximate meat value of $92 for each adult male pronghorn, $77 for each adult female pronghorn and $56 for each fawn. The estimated 1989 harvest was 2536 adult males, 1411 adult females and 137 fawns producing an overall meat value of $350 000.

It is very difficult to obtain dollar values for nonconsumptive use of wildlife because it is an activity often associated with many other things we do. Furthermore, nonconsumptive use is not usually species specific, so it would be difficult to assign a value to a particular animal. Both Philips et al. (1977b) and Filion et al. (1989) calculated values for nonconsumptive use. Philips et al. (1977b) provided only an extra-market value of three dollars per participant per day for all wildlife or a total of $50 035 800 which, adjusted to 1989 dollars, would be $122 million. Antelope were twelfth on a list of animals people would most like to see. Filion's study determined expenditures for trips where the primary intent was nonconsumptive wildlife use. Twenty-two percent of Albertans participated in these types of trips and spent $771 per year for equipment, supplies and services in 1987. Adjusted to 1989 this would be $840 (771 X 1.09) per participant per year or a total of $448 million. Ten percent of the trips involved encounters with large mammals (Filion et al. 1989). If pronghorns are assumed to make up 10 percent of the larger mammal encounters, then expenditures attributed to them would be $4.5 million.

Although these figures are not precise, it is obvious that nonconsumptive use of pronghorn antelope alone and in conjunction with other wildlife provide an important stimulus in the Alberta economy. The total value of hunting and nonconsumptive use of antelope appears to be in the $6.6 million range annually.

The incidence of pronghorn damage complaints is very low. During four years there was a total of only 47 complaints related to crop damage by antelope (1982/83 - 12; 1983/84 - 10; 1984/85 - 15; 1985/86 - 10; Annual Incidence Report System). This is approximately 3 percent of total ungulate-related complaints and spans a period when pronghorns were at record high numbers in Alberta. The actual dollar loss of crops damaged by pronghorns from 1980 to 1983 was $11 235. The amount paid in compensation from the Wildlife Damage Fund for this same period was $7413. The low level of damage complaints against pronghorns likely reflects the preference of pronghorns for natural forage as well as a tolerance by prairie farmers for this species.

2.3.5 Current Management Programs for Pronghorn Antelope in Alberta

The Fish and Wildlife Policy (Fish and Wildlife Division 1982) set a general goal of maintaining the current population and habitat for pronghorns. The Status of the Fish and Wildlife Resource in Alberta (Fish and Wildlife Division 1984) indicated antelope numbers should be maintained between 10 000 and 18 000 animals. The current management program is designed to meet population and habitat goals, maintain a quality hunting experience, enhance hunter-landowner relations and minimize crop damage caused by pronghorns.

2.3.5.1 Pronghorn Antelope Population Inventory

Antelope population inventory annually occurs in half of the eight Antelope Management Areas, in accordance with the Provincial Survey Format outlined in Appendix IV. This survey format results in observation of about 12 percent of the estimated total population for all management areas and up to 25 percent of the estimated populations in the management areas covered by the current year's survey.

2.3.5.2 Pronghorn Antelope Habitat Inventory

Mapping and assessment of pronghorn habitat has been done at several different scales in the province. A 1:1 000 000 scale ecological land classification (ELC)-type landscape map of Alberta depicting 12 broad climatic regions and 278 physiographic/landform subregions was prepared by Pedocan (1984). One of four arbitrary current habitat suitability classes (best, moderate, poor, inadequate) was assigned to each subregion. Provincially there were 27 394 km^2 of "best" (4 percent of Alberta), 29 059 km^2 of "moderate" (5 percent of Alberta), 16 960 km^2 of "poor" (3 percent of Alberta), and 535 180 km^2 of "inadequate" (88 percent of Alberta). Mean summer densities of pronghorns for the four habitat suitability classes were estimated to be 0.5 antelope per km^2 (best), 0.3 antelope per km^2 (moderate), 0.1 antelope per km^2 (poor) and 0 antelope per km^2 (inadequate), producing a provincial population estimate, based solely on habitat, of 24 109 pronghorn antelope. This scale of habitat mapping is useful only for a provincial overview and cannot be used at the WMU level.

For operational use, a mapping scale at the quarter-section to one-section size is desirable because it can be used effectively for planning and conducting aerial surveys and directing habitat protection/development efforts. The Southern and Central Fish and Wildlife regions have completed mapping at the one-section scale for all of the pronghorn range in Alberta. The mapping technique involves the identification of native prairie, hayland and cropland. The first mapping was done in 1970 by the Southern Region and was recently updated in 1983 for both regions by Haag (1986). The Central Region updated Haag's work in 1986. Updates are planned to occur every 3 to 10 years depending on the magnitude of land use change. Within the overall range, Barrett and Vriend (1980) made a more detailed assessment of sage availability and identified the important winter ranges. Efforts to expand this knowledge continue. Antelope winter ranges are also identified on the "Wildlife Key Area" maps, which were first produced in 1972 and have been updated periodically since that time, most recently in 1981.

The habitat inventory discussed up to this point has dealt mainly with programs that determine how much and where the habitat is. This reveals very little about the quality of the habitat which is the capacity to provide food (particularly critical in winter) and to a lesser extent cover for pronghorns. Barrett (1974, 1982) examined the quality and capacity of antelope winter range, but there has been no systematic annual program designed to monitor the quality of antelope range.

2.3.5.3 Pronghorn Antelope Habitat Protection and Development

Habitat protection approaches are different for public land than private land, but the intent is to retain existing quantities and quality of habitat on both. On public land, important antelope habitat has been identified through habitat assessment and the Division's interest has been declared through the key area maps and the public land reservation system. Through the referral process the Division makes recommendations that retain habitat, reduce the impact of various land uses or mitigate habitat losses resulting from the land uses. The land uses include activities related to the following: seismic lines, wellsites, pipelines, power lines, coal mines, water impoundments, roads, cultivation for annual cropland, more intensified grazing, urbanization, industrial plant sites, and high density outdoor recreation developments.

There are also smaller parcels of public land where wildlife values are part of the planning process such as the Range Improvement Program administered by the Public Lands Division. Wildlife concerns also form part of the input for major projects managed by Alberta Environment such as the Three Rivers Dam.

The approach for habitat protection on private land occurs through planning and dealing directly with private landowners. The planning level inputs were made into the regional planning commission plans and at the county, municipal district, improvement district and special area levels in the 1970s and early 1980s. Generally, the plans identified important wildlife areas, including pronghorn range, and stressed their importance to the local people, although there were no land use bylaws that specifically protected habitat solely for wildlife.

Dealing directly with the private landowner focuses on four areas.

The first area involves the provision of information on the habitat requirements of antelope. The second area involves assistance in the prevention of antelope damage. The third area is the promotion of better hunter-landowner relations through hunter training, the Use Respect Program and enforcement of trespass laws. The fourth area is the provision of direct incentives to retain and/or improve wildlife habitat by providing landowner cooperators with recognition items (signs, hats, pins, crests), cash payments, tax relief, and developments such as fencing, watering sites and stream crossings to improve on-farm management of livestock. This program started as a pilot project in the county of Red Deer in 1978 with the retention of 4452 ha of habitat. It has recently been expanded to other municipal jurisdictions in the Central, Northeast and Southern regions. It is jointly funded by the Alberta Fish and Wildlife Division and Wildlife Habitat Canada and is administered by the Division. Pronghorns are one of the species that may benefit from such a program, although this program has not yet expanded into antelope range.

There have been no habitat development projects to date that were designed specifically to benefit antelope, because existing current habitat levels can support population goals. However, there continues to be a gradual loss of native rangeland to other uses and development may be desirable in the future. The present emphasis remains in the area of protecting the habitat that exists now.

2.3.5.4 Pronghorn Antelope Population Management and Recreational Hunting

The pronghorn antelope herd is limited by habitat quantity and quality, weather severity, competition with domestic ungulates, predation, parasites and disease, accidents and hunting. Although the effect of these limiting or mortality factors can be manipulated to varying degrees by management, much of the effort in Alberta is currently directed towards hunting because it has replaced much of the mortality previously attributed to other factors. This section will deal with the management and allocation of hunting opportunity for pronghorn antelope in Alberta. Section 2.3.5.6, which follows, will deal with the other mortality factors.

Phillips et al. (1977b) found that the three major reasons for hunting were for enjoyment (44 percent), to get meat (37 percent) and to get a trophy (17 percent). The desire for trophies is probably higher for antelope than the 17 percent for big game generally. The current system of allocating recreational hunting of pronghorns attempts to provide a variety of opportunities while minimizing hunter-landowner conflicts and using hunting harvest as one tool to reduce antelope damage. Some general principles regarding hunting seasons have been applied to antelope.

The number of hunters must be controlled using a limited entry draw (special licence) because the pronghorn antelope is a very vulnerable herd animal that lives in open terrain and would be overharvested under a general licence. Hunter numbers are also controlled to maintain a reasonably high quality hunting experience. The season length is short, usually one to two weeks, to minimize disturbance of landowners. The general season occurs during the month of October after the antelope rut is completed, after most farming operations are completed and before the males begin to shed their horn sheaths. There is provision for an "archery only" time period preceding the general season.

2.3.5.5 Recreation and Harvest Goals for Pronghorn Antelope Hunting

The main recreational harvest goal is to provide a quality hunting opportunity and a high chance of success in harvesting a trophy buck. Quality has been enhanced by limiting hunter densities to one hunter per 10 km^2 of antelope habitat, by opening trophy seasons before non-trophy, by encouraging hunting by foot (e.g., no carrying of weapons on off-highway vehicles in the morning, no discharge of weapons within 46 metres of a vehicle) and by working with landowners to maintain access to private land (e.g., promoting the Use Respect Program, asking for input during determination of annual permit numbers). The goal is to maintain hunter success rates in excess of 70 percent. To fairly distribute the chances of being drawn for the limited number of licences, hunters successful in receiving a trophy licence may not apply for one during the following two years.

Additional recreational hunting opportunity is provided through a resident non-trophy antelope season. Similar techniques are used to maintain a quality hunting experience, but the main goal is to manage the number of animals in the herd to stay within the carrying capacity of the winter range. Hunter success rates consistently exceed 80 percent for this hunt. Since the demand for this licence type is lower than that for a trophy licence, hunters may apply every year.

Resident hunters are allowed to apply for an archery licence, a trophy licence and a non-trophy licence in the same year if they are eligible but may only possess one licence. The archery draw is made first, followed by trophy and non-trophy. Successful applicants then become ineligible for the subsequent draws. Archers are provided with a season prior to the general season.

Annual harvest goals are the difference between the estimated July population and the postseason population goal. The 1989 postseason goal appears in Table 11 and is based on the estimated capacity of the known winter ranges. During periods of very high populations (e.g., 1986) the harvest goal cannot be met if regular seasons and maximum hunter density restrictions are followed. Options such as additional licences, additional tags and additional seasons must be considered in these cases.

The Harvest Information System for Pronghorn Antelope - Systematic population inventories are conducted in half the Antelope Management Areas annually and used to estimate July population levels. Twenty percent of the hunters are contacted annually during the telephone harvest questionnaire. The harvest survey is accurate to plus or minus 15 percent at the management area level and 5 percent provincially; such degrees of accuracy are suitable for current management purposes. The information from the harvest survey provides an indication of population levels in unsurveyed management areas and determines whether annual harvest goals have been achieved. Since age/sex herd composition can be determined during July aerial surveys, jaws are not collected regularly to determine age structure in the population. However, jaws may be collected periodically for special projects (e.g., accurate determination of age distribution in the harvest).

Table 11. Postseason pronghorn antelope population goals in Alberta in 1989.

Antelope Management Area	Number of Animals			
	Bucks	Does	Fawns	Total
A	162	649	389	1 200
B	68	270	162	500
C	351	1 406	843	2 600
D	122	486	292	900
E	365	1 459	876	2 700
F	541	2 162	1 297	4 000
G	237	947	616	1 800
H	237	947	616	1 800
TOTAL	2 083	8 326	5 091	15 500

2.3.5.6 Pronghorn Antelope Population Management and Non-Hunting Mortality

Non-hunting mortality factors that limit the pronghorn antelope population are habitat quantity and quality, weather severity, predation, parasites and disease, and accidents.

Habitat - The amount and quality of habitat interacting with annual variations in weather severity ultimately determines annual natality, survival and recruitment. Habitat inventory, retention and development programs are covered in sections 2.3.5.2 and 2.3.5.3.

Weather Severity - Weather severity is monitored in a general way during the critical winter months. The Fish and Wildlife Division has responded to severe winters during some years (e.g., the winter of 1984/85) by providing emergency winter feed. The general approach has been to recognize that annual winter mortality is a natural event and intervention should occur only under severe emergency conditions (Gurba and Neave 1979). It is difficult to feed antelope because their main winter food (sagebrush) is so different from potential emergency feed, which makes it difficult for them to adapt physiologically to a new food source. Murray (1986) conducted some experimental feeding trials in Alberta during the winter of 1985-86, but the results were inconclusive due to the mild winter. The rations used in these trials are identified in Appendix V.

Predation - Barrett (1978, 1982) documented high mortality of fawns due to coyote predation and some fawn loss to bobcats, but he suggested this was not limiting the population. Coyotes also take some adults in Alberta but total losses are felt to be small. Predation may slow down population recovery following large scale population declines. There are no current programs to reduce predators to increase antelope populations. However, hunting, trapping and agricultural pest control practices likely reduce local populations of coyotes and bobcats and may increase survival in areas where such practices occur.

Parasites and Disease - Parasites and diseases of antelope are monitored by the Division and the Provincial Veterinary Laboratories as complaints are received or carcasses are submitted. Universities may get involved on a project-specific basis. However, there is no systematic collection of antelope to monitor parasites and disease. Mitchell (1980) suggested these latter two were relatively unimportant as causative agents of mortality.

Accidental Death - The Division monitors complaints regarding vehicle collisions and other accidental deaths, but there is no systematic monitoring taking place.

2.3.5.7 Management of Damage Caused by Antelope Populations

Crop damage caused by antelope is quite limited but may be locally severe. Because it usually occurs in field situations, practical cost-effective prevention methods have not yet been found. Compensation for antelope damage to standing and swathed crops is available and covers a percentage of the crop value. The major emphasis has been to maintain antelope populations within goal levels so they remain on native range away from agricultural crops.

2.4 Management Issues and Future Implications

There have been major advances in knowledge about antelope populations in Alberta over the past 30 years. During the same period the consumptive interest in the resource has increased fourfold and has exceeded the supply for more than 20 years. Awareness of antelope populations and nonconsumptive interest has also increased substantially, particularly in the last decade. At the same time, intensified use of the landscape for agriculture has significantly increased competition for the land base that constitutes pronghorn antelope habitat. Several major management issues must be addressed if antelope populations are to be maintained to meet future consumptive and nonconsumptive public needs.

2.4.1 Recreational Use

The harvest of antelope must be controlled by limiting the number of hunters in some way, because the herd would be overharvested under an open general licence season. Three important considerations in determining the hunting regime are hunting opportunity, quality of the hunting experience and landowner support. These considerations must be dealt with in the context of the goal to maintain a stable postseason antelope population.

The hunting regime must be designed both to provide equitable hunting opportunities with an acceptable quality of hunting experience and to maintain a cooperative working relationship with landowners that ensures access to privately owned and leased land. The current hunting regime, using a limited entry draw and wait-out periods for licence eligibility, has been effective in allocating opportunity and maintaining hunter densities at levels acceptable to both hunters and landowners. However, because of the short hunting season and limits on hunter density, it has been difficult to achieve desirable harvest levels during periods of very high populations. Licencing flexibility such as quota licences and multiple tags and the ability to extend seasons must be retained to keep the herd within the capabilities of its winter range.

Information on the biology and distribution of antelope in Alberta must become readily available to the public. Opportunities for nonconsumptive users to interact (e.g., viewing sites and guides) with antelope populations must be increased. However, care must be taken to avoid increased disturbance of both the animals and the landowners.

2.4.2 Habitat Retention and Enhancement

The precision of current pronghorn antelope habitat inventory (mapping and assessment of suitability) is inadequate, particularly for winter range. Initial emphasis should be on better delineation of winter range and assessment of its carrying capacity during the critical winter period. Current inventories of summer range identify the extensive nature of the range but do not adequately identify the essential components and important use areas of the range. Better habitat inventory will allow more accurate goal setting for habitat and populations at the WMU level and will provide a better focus for habitat retention and enhancement programs.

The retention of antelope habitat on privately owned and leased public land is essential as the majority of the habitat falls in these two land ownership categories. Habitat enhancement, particularly on winter ranges, must be pursued to mitigate the small but steady losses that have occurred and probably will continue to occur on these ranges. Enhancement can mitigate small losses and even provide for modest population increases, but the long-term existence of pronghorns will depend on a successful habitat retention program.

2.4.3 Population Management

Current population inventory programs to determine population size, distribution, age/sex structure and productivity should continue, but the methodology and data should be tested to determine the level of precision. Increased precision could result in more overall recreational opportunity as population characteristics are better defined. Efforts to determine distribution and relative range use should be expanded to assist in the identification of important components and areas of antelope range, particularly winter range. Suitable methodology and strategies should be explored to reduce the magnitude of losses during severe winters.

2.4.4 Protection of Property

Antelope damage on private land is quite limited and is minimized by keeping populations at acceptable levels. Compensation is provided for damage to standing and swathed crops. However, damage losses can be locally extensive, so improvement of the compensation program and use of nonmonetary compensation (e.g., habitat enhancement to keep antelope away from crops or to improve forage for both antelope and domestic livestock) may encourage habitat retention and maintain access for recreational use of the resource in the future.

2.4.5 The Future

Failure to address the above major management issues will result in the long-term decline of both consumptive and nonconsumptive recreational opportunity because habitat and antelope populations will decline, while conflicts between the users, the landowners and the resource may intensify. The "Management Plan" that follows incorporates the desirable features of the current management program as well as identifying new strategies to address the management issues identified here. The plan is intended to reflect the needs for pronghorn antelope management in Alberta over the next 10 years.

3.0 MANAGEMENT PLAN

3.1 Policy Framework

The Fish and Wildlife Policy for Alberta (Fish and Wildlife Division 1982) established, in the Wildlife Policy portion, goals for the administration of wildlife resources in Alberta. Quotes from this policy provide a framework for the formation of specific management plan goals for pronghorn antelope and are set out under five general categories.

1. Resource Protection

"1) ... The primary consideration of the Government is to ensure that wildlife populations are protected from severe decline and that viable populations are maintained."

2. Resource Allocation

"2)(a) The wildlife resource, as a Crown resource, will be utilized in a manner which contributes the most benefit to the citizens of Alberta."

"2)(e) Wildlife will be allocated through a defined process whereby specific resources are deployed to specified uses in order to achieve stated public benefits."

"17) Wildlife must be allocated among different primary users in response to government policy. Until such time as supply and demand can be better rationalized, the following interim allocation guidelines will prevail in order of priority:

...(b) Resident recreational use of game will have precedence over non-resident use. Wildlife stocks not fully allocated or utilized to higher priority uses may be allocated commercially to non-residents."

"18) The allocation of wildlife stocks to the different primary uses does not imply that other uses cannot occur within areas where such uses are entitled."

3. **Recreational Use**

"8) A variety of wildlife recreational opportunities, in addition to hunting, will be available for the benefit and enjoyment of Albertans."

"21) A variety of hunting opportunities will be available for the recreational benefit and enjoyment of Albertans ..."

4. **Commercial Use**

"22) The Division will encourage an environment that promotes the growth of the tourist industry...."

5. **Protection of Private Property**

"4) The Government, through the Division, will assist in preventing or controlling wildlife from damaging property and endangering human life."

"5) Responsibility for damage in any form caused by wildlife will be shared in relationship to what people can reasonably do for themselves and to the amount of any additional damage beyond that which would normally be expected to occur in an area."

3.2 Management Goals and Objectives

3.2.1 Resource Protection

Goal: To ensure that viable populations of pronghorn antelope are maintained throughout their current range.

Objective:

a) Maintain the viability of the eight management area populations associated with the 12 known winter ranges as shown in Figure 7. This objective will be reached by doing the following:
    - a.i protecting pronghorn populations from overharvest, illegal hunting, extreme winter mortality, disturbance and disease, and
    - a.ii maintaining habitat quality on all wintering areas.

3.2.2 Resource Allocation

Goal: To maximize the benefits to Albertans through the optimum allocation of the pronghorn antelope resource.

Objectives:

a) Provide a variety of recreational hunting opportunities to 4770 residents that result in a harvest of 3340 pronghorns annually.

b) Provide the opportunity for 1.5 million Albertans to spend 80 million days on directly related nonconsumptive wildlife* activities.

c) Provide an opportunity for 100 non-resident hunters to harvest 70 trophy antelope during 300 recreation days, while providing an economic return to outfitters, guides and other Albertans providing goods and services.

d) Promote and encourage scientific and educational activity that will enhance our knowledge of pronghorns.

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* "Nonconsumptive" goals and objectives are not developed by species so this objective includes all wildlife species involved in nonconsumptive activities, not just antelope.

3.2.3 Recreational Use

Goal: To maximize the recreational benefits and enjoyment to Albertans from the pronghorn antelope resource through provision of a variety of types and amounts of recreational opportunities.

Subgoals:

1. To provide the maximum opportunity to hunt trophy antelope in a quality hunting situation where hunter densities will not exceed one per 5 km^2 and there will be a chance to shoot a large trophy buck.
2. To provide the maximum opportunity to hunt non-trophy antelope.
3. To provide an opportunity to hunt antelope with a bow and arrow.
4. To provide the maximum opportunity for directly related nonconsumptive wildlife activities (viewing, photographing, studying, improving habitat for) to all Albertans.

Objectives:

a) Provide the opportunity for 2270 residents to hunt 4540 days and harvest 1590 trophy antelope with hunter success rate of 70 percent.

b) Provide the opportunity for 2075 residents to hunt 4150 days and harvest 1660 non-trophy antelope with a hunter success rate of 80 percent.

c) Provide the opportunity for 350 bow hunters to hunt 1370 days and harvest 90 antelope (80 trophy, 10 non-trophy) with a hunter success rate of 25 percent.

d) Provide the opportunity for 1.5 million Albertans to spend 80 million days on directly related nonconsumptive wildlife activities (objectives for nonconsumptive use are not developed by species so antelope is just one of the many wildlife species involved).

3.2.4 Commercial Use

Goal: To provide the opportunity for Albertans to benefit economically from the commercial use of the antelope resource.

Objective:

Provide an opportunity for outfitters, guides and other Albertans providing goods and services to benefit economically from non-resident use of the antelope resource. The number of antelope licences allocated to non-resident hunting, will be determined by the Non-resident Big Game Outfitting and Guiding Policy.

3.2.5 Science and Education

Goal: To promote and encourage scientific and educational programs that will enhance the knowledge of the biology of pronghorns and their socioeconomic benefits to Albertans.

3.2.6. Protection of Property

Goal: To minimize property damage caused by antelope.

Objective:

Keep the annual damage by antelope below $25 000.

3.2.7 Population and Habitat

Goal: To ensure that pronghorn antelope populations and habitat are managed to meet the resource requirements of the recreational and economic goals and objectives.

Objectives:

a) Maintain a winter pronghorn population of 15 500 animals which will provide a fall population of 18 910 animals with a harvestable surplus of 1740 trophy antelope and 1670 non-trophy antelope annually (Table 12). Annual numbers may fluctuate above and below these goals because of environmental factors such as winter weather.

b) Maintain eight Antelope Management Areas and manage the pronghorn herds on the basis of 12 recognized winter ranges (Figure 7) and any additional winter ranges that may be discovered.

c) Maintain 25 900 km^2 of natural grass prairie summer range to support the pre-hunting season population of 18 910 pronghorns and 3290 km^2 of winter range to support the winter population of 15 500.

3.3 Management Strategies

3.3.1 Population Management

The pronghorn antelope population will be managed, through a variety of strategies, to provide recreational hunting opportunities, an opportunity for widespread nonconsumptive enjoyment and an opportunity for Albertans to benefit from guiding and servicing users (both hunters and general tourists).

3.3.1.1 Trophy Antelope Harvest Regime

The harvest regimes are derived from the population model presented in Appendix VI and are based on many assumptions that require further testing in the future. Males will be harvested to provide a maximum sustained yield of trophy bucks (including some bucks with larger horns) by maintaining the population at the postseason goal (Table 11) and by maintaining a postseason sex ratio of 30 bucks:100 does. This represents an average male harvest goal of 9 percent of the preseason population (or 43 percent of the number of preseason males). The current definition for trophy, which is any male pronghorn antelope with horns 12.6 cm (5 in.) or more in length, will be maintained.

Table 12. Fall preseason and winter pronghorn population goals and annual harvestable surplus.

Management Areas	Fall Preseason Population Goal				Winter Population Goal				Annual Harvestable Surplus			
	Bucks	Does	Fawns	Total	Bucks	Does	Fawns	Total	Bucks	Does	Fawns	Total
A	316	702	442	1 460	182	606	412	1 200	134	96	30	260
B	132	293	185	610	76	252	172	500	56	41	13	110
C	686	1 524	960	3 170	394	1 313	893	2 600	292	211	67	570
D	238	529	333	1 100	136	455	309	900	102	74	24	200
E	712	1 582	996	3 290	409	1 364	927	2 700	303	218	69	590
F	1 056	2 346	1 478	4 880	606	2 020	1 374	4 000	450	326	104	880
G	476	1 058	666	2 200	273	909	618	1 800	203	149	48	400
H	476	1 058	666	2 200	273	909	618	1 800	203	149	48	400
TOTAL	4 092	9 092	5 726	18 910	2 349	7 828	5 323	15 500	1 743	1 264	403	3 410

3.3.1.2 Non-Trophy Antelope Harvest Regime

Female and fawns will be harvested to provide a maximum sustained yield of non-trophy antelope by maintaining the population at the postseason goal (Table 11) and by maintaining a postseason sex ratio of 30 bucks:100 does. This represents an average non-trophy harvest goal of 9 percent of the preseason population (or 14 percent of the number of preseason does and 7 percent of the number of preseason fawns). The current definition for non-trophy, which is any pronghorn with horns 7.6 cm (3 in.) or less in length, will be maintained.

3.3.1.3 Harvest Rate Adjustments

The trophy and non-trophy harvest goals will be adjusted upward or downward to meet the postseason population goal. Upward adjustments will be limited by the maximum allowable hunter density in each management area (Table 13) unless additional time periods are provided. Maximum allowable hunter densities are designed to maintain a quality hunting experience and minimize disturbance to landowners. Downward adjustments in the harvest rate will be 2.25 percent for every 10 percent the preseason population is below the goal of 18 910. This means there will be a non-trophy season closure when the preseason population is 11 346 (60 percent of the preseason goal) or below. The trophy harvest will be adjusted downward to maintain the 30 bucks:100 does postseason sex ratio. This would result in a trophy harvest rate of 9 percent of the preseason population when the preseason population is at 60 percent of the preseason goal. This 9 percent rate will continue to be used for trophy antelope until the preseason population reaches 3000 at which time the trophy season will be closed.

3.3.2 Licencing and Use Management

3.3.2.1 Recreational Hunting of Trophy Antelope

Resident hunters will be licenced using a limited entry draw. The number of resident Trophy Antelope Special Licences will be determined by Antelope Hunting Area by dividing the allowable harvest of trophy antelope by the mean hunter success rate for the previous three years. Hunters successful in the Trophy Antelope Special Licence draw will not

Table 13. Guidelines for the maximum numbers of pronghorn antelope hunters in the field during a hunting season.

Antelope Management Area	Recommended Maximum Number of Hunters
A	300
B	175
C	600
D	250
E	530
F	600
G	750
H	750
Total	3955

be eligible to apply for this licence in the following two calendar years.

Non-resident hunters must be accompanied by a guide and will be licenced using a limited-entry draw or special licence available through an outfitter-guide. Non-resident hunters obtaining a Trophy Antelope Special Licence will not be eligible to obtain or apply for this licence in the following two calendar years.

All trophy hunters - If the number of applicants for Trophy Antelope Special Licences exceeds the number of licences available by 2.5 times for two consecutive years, longer wait-out periods for applicants will be considered.

3.3.2.2 Recreational Hunting of Non-trophy Antelope

Non-trophy Antelope Special Licences will be available only to residents and will be issued using a limited-entry draw. The number of licences will be determined by management area by dividing the allowable harvest of non-trophy antelope by the mean hunter success rate for the previous three years.

3.3.2.3 Antelope Archery Hunting

Resident hunters will be licenced using a limited-entry draw. There will be 350 licences available. If the number of applicants for this licence exceeds the number available by more than 2.5 times for two consecutive years, a wait-out period for applicants will be considered.

Non-resident hunters must be accompanied by a guide and a limited number of licences will be available through an outfitter-guide.

3.3.2.4 Antelope Licence Combinations

Hunters may apply for a Non-trophy Antelope Special Licence and an Antelope Archery Special Licence every year. Hunters meeting the application eligibility requirements for the Trophy Antelope Special Licence may apply for all three licences, but may possess only one of these licences. The Antelope Archery Special Licence draw will be conducted first. Those hunters drawn for an Antelope Archery Special Licence will not be included in the Trophy or Non-trophy Antelope Special Licence draws. The Trophy Antelope Special Licence Draw will be conducted second. Those hunters drawn for a Trophy Antelope Special Licence will not be included in the Non-trophy Antelope Special Licence Draw. The non-trophy draw will be conducted last. One tag for one animal will normally be issued with a Non-trophy Antelope Special Licence. If there is a significant undersubscription in the non-trophy draw or a need to reduce the herd for management purposes, the issue of multiple tags (for more than one animal) with each licence may be considered to achieve the harvest goal.

3.3.2.5 Guiding and Outfitting

Non-residents are required to be accompanied by a licenced guide to hunt pronghorn antelope in Alberta. The number of trophy antelope licences allocated to non-resident use will be determined by the Non-Resident Big Game Outfitting and Guiding Policy. Outfitters may also guide residents and non-residents on nonconsumptive outings to observe and photograph antelope.

3.3.2.6 Nonconsumptive Use

The entire pronghorn antelope population is available for nonconsumptive use at any time even though some animals have been allocated for consumptive use and will be removed during the hunting season. The main strategy therefore is to enhance the opportunity for the public to interact with the antelope herd. This will be accomplished by doing the following:

a) maintaining a widely distributed and viewable pronghorn antelope population,
b) providing written material on the natural history and management challenges for antelope in Alberta,
c) enhancing public knowledge of specific dates, times and places where pronghorns can be viewed by providing an antelope viewing guide (to be incorporated with a number of other wildlife species in a more comprehensive guide),
d) enlisting the assistance of the public in pronghorn antelope management programs such as habitat enhancement, damage prevention and population inventory and more general programs such as Use Respect and Outdoor Observer.

3.3.3 Hunting Seasons

Hunting seasons will occur during the month of October, after the majority of the rut is completed and before the onset of male horn sheath loss in early November. The season will be one to two weeks in length with trophy seasons normally opening before non-trophy seasons. An archery-only time period will normally precede the general season. Season length and bag limits are not sufficient to control the harvest of pronghorn antelope so a special licence draw must be used. This limits the number of hunters and controls the harvest, maintains a reasonable quality hunt by controlling hunter density and minimizes landowner disturbance.

3.3.4 Hunter Effort and Success

Hunter success depends on how many animals there are in a given area, how available the animals are (vehicle access, terrain, and permission to hunt) and the timing and length of the season. Pronghorn antelope populations and seasons will be managed to provide an average of two days effort per hunter per year with an expected harvest success rate of 70 percent for trophy antelope and 80 percent for non-trophy antelope. Hunter effort and success will be monitored annually using a telephone harvest questionnaire and periodic collections of antelope lower jaws.

3.3.5 Public Education and Information

3.3.5.1 Conservation Education

The Alberta Conservation and Hunter Education program should continue to address its broad spectrum of topics such as user ethics, wildlife identification and management, firearm use and safety, field hunting and game handling techniques, and survival/first aid techniques. When dealing with pronghorn antelope, the emphasis should be on firearm safety, respect for private property, ethical hunting techniques, the humane kill of the animal, the proper care and handling of the carcass, and summary of the management goals, objectives and strategies for pronghorn antelope in Alberta. The latter will require an expansion of the current "wildlife management" section to include the species level. Ongoing programs such as Use Respect and Outdoor Observer which provide an annual emphasis on certain aspects of the conservation education program should be continued. An annual summary of the current year's hunter harvest and effort should be available to the public.

3.3.6 Habitat Management

Habitat sufficient to meet the provincial and local population goals will be provided as a result of both retention programs and development programs on private and public land. Development programs, which increase the carrying capacity of habitat, may add new habitat or mitigate the loss of habitat that was not protected under the retention program.

3.3.6.1 Habitat Retention

The steps involved in a habitat retention program are as follows:

Inventory - Habitat inventory and habitat retention goals must be established for each Wildlife Management Unit. Inventory will be covered in Section 3.3.10.1. Habitat retention goals by Antelope Management Area are outlined in Table 14. Specific locations and areas of known winter ranges are outlined in Figure 7 and Table 8.

Integration - Habitat retention goals for pronghorn antelope must be integrated with other wildlife species and with other uses of the land base. Integration is accomplished through participation in regional and local planning on private land (e.g., Regional Planning Commission Plans and local Municipality or Special Areas Land Use Plans and Bylaws) and public land (e.g., Integrated Resource Plans and River Basin Plans).

Application of Retention Goals - Specific retention goals must be applied to small parcels of both private and public land.

The next level of input and integration on private land must occur through land use plans and agreements with individual landowners. The agreements will recognize the landowner for retaining important pronghorn antelope habitat and may provide some form of reward for doing so. If Class 1 or 2 pronghorn habitat (based on a four-class habitat

Table 14. Habitat goals to meet the 1999 population goals.

Antelope Management Area	1999 Summer Population Goal	1999 Winter Population Goal		Square Kilometres of Habitat Required	
		Dec.	Apr.	Summer Range[a]	Winter Range[b]
A	1 460	1 200	1 040	2 000	260
B	610	500	430	840	110
C	3 170	2 600	2 250	4 340	550
D	1 100	900	780	1 510	190
E	3 290	2 700	2 340	4 510	570
F	4 880	4 000	3 460	6 680	850
G	2 200	1 800	1 560	3 010	380
H	2 200	1 800	1 560	3 010	380
Total	18 910	15 500[c]	13 420	25 900	3 290

[a] It was assumed that the average density on summer range is 0.73 pronghorn antelope per km^2 (based on aerial survey data). The word "range" refers to native grass prairie and does not include cultivated crops and hay. Area has been rounded to the nearest ten.

[b] It was assumed that the average density on winter range is 4.7 pronghorn antelope per km^2 (based on current use of known winter range). The amount of winter range is based on the December population goal. The word "range" refers to native grass prairie and does not include cultivated crops and hay. Area has been rounded to the nearest ten.

[c] This total does not include the C.F.B. Suffield herd which would number around 2000; there is limited control over this herd because there is no hunting harvest. An additional 425 km^2 of winter range, currently present in Suffield would be required to winter these animals.

capability system with Class 1 being best) on private land is threatened and cannot be protected through agreement (i.e., the landowner does not want to participate in the retention program and has indicated a desire to remove the habitat) and there is little chance of mitigating the loss, then purchase should be considered.

Integration of habitat retention goals on public land occurs through the government land use referral process. Referrals may result in a standard condition to protect habitat or individual recommendations for each referral regarding habitat retention during land use activities such as, agricultural expansion and intensification, oil and gas exploration and development, transmission line and transportation corridor development, recreation development, mining exploration and development, thermal power generation development, development of dams for flow regulation and hydropower, and urban expansion. Guidelines to maintain quality pronghorn antelope habitat generally involve restrictions on the type, size, shape and level of use, restrictions on the location or time period of use, controls on the type of public access to the development site and suggestions for reclamation. If the important habitat for pronghorn antelope has not been identified in planning documents used by referral agencies, then such habitat should be flagged with an appropriate Fish and Wildlife reservation. If referrals are not successful in retaining habitat, then the loss should be mitigated via habitat enhancement in another location.

3.3.6.2 Habitat Enhancement

Habitat enhancement--increasing the carrying capacity of a unit of land--may take place on private or public land but the latter would have priority. The highest priority for enhancement of pronghorn antelope habitat should be parcels of public land in areas where habitat loss is occurring on private land and where crop damage is severe on private land, particularly on winter ranges where large numbers of animals concentrate in small areas. Enhancement techniques to be considered would be managed livestock grazing to encourage desirable plant species composition, controlled burning and/or chaining to improve plant species diversity and quality of winter range, planting of important winter range food species and cooperative planting of cereal crops (e.g., winter wheat or fall rye) to act as lure crops to reduce surrounding crop damage and provide a high quality fall/winter/spring food source. Site-specific plans will have to be developed by regional wildlife and habitat staff.

3.3.7 Predator Management

Coyotes and bobcats have been identified as causing significant mortality in pronghorn antelope fawns (Barrett 1982). Both predators are currently harvested during annual trapping seasons and damage control on private land. Since the pronghorn antelope population continues to maintain a high level of productivity and is within established goals over most of its range, no widespread predator management program is proposed at this time.

3.3.8 Other Mortality Factors

3.3.8.1 Winter Mortality

The length of winter, depth of snow and number of days with very cold temperatures have a profound effect on survival and spring fawn production. These climatic features will be monitored to produce a winter severity index. If a significant winter die-off is predicted, a winter feeding program may be considered for pronghorn antelope. Further development and testing of food rations and techniques such as those used by Murray (1986) will be necessary before extensive feeding takes place.

3.3.8.2 Parasites and Diseases

Parasites and diseases are not known to cause significant mortality in Alberta pronghorn antelope, but monitoring should be continued by examining carcasses submitted by hunters, landowners and district and regional staff. Staff should continue to seek the assistance of university and Provincial Veterinary Laboratory staff who specialize in the identification and diagnosis of parasites and diseases of wildlife.

3.3.8.3 Accidental Deaths

Accidental deaths may be locally significant, particularly those associated with vehicle collisions during winters when deep snow forces antelope onto roads and railway tracks. There are also many vehicle collision deaths through the rest of the year, but current knowledge indicates those deaths are widely dispersed, making fencing and/or overpasses impractical. Vehicle collision deaths should be monitored and winter solutions such as plowed travel corridors and lure sites should be considered where animals are concentrated and significant mortality is occurring or anticipated. Antelope often get caught up in fences so landowners and government agencies replacing fences or building new fences should be encouraged to use a smooth bottom strand of wire 41 cm above the ground to allow safe passage of antelope. Irrigation canal upgrading should be monitored because antelope are unable to cross the new, smooth concrete canals. If accidental drowning becomes significant, fencing and overpasses should be considered.

3.3.8.4 Illegal Harvest

The illegal harvest is likely quite small for pronghorn antelope, probably related to the open terrain where they are highly visible and because they have a small carcass weight. Current levels of enforcement should be maintained, particularly during the hunting season, to ensure that the illegal harvest is kept low and the hunt is conducted in an ethical manner.

3.3.9 Protection of Private Property

Damage by pronghorn antelope is very limited and generally involves fall-planted cereal crops such as winter wheat or fall rye. Complaints will be handled through the district offices. Landowners will be provided with assistance in the prevention and control of the damage.

Prevention would involve scaring devices which provide some short-term relief. In locations of chronic damage, on traditional winter range, prevention may include lure crops or intercept feeding sites if investigation shows these are effective techniques.

Control involves the removal of animals. Hunting will be used to maintain herds within the population goal for a particular area. Other control methods such as trapping and relocating or the issuing of kill permits are either too expensive, impractical, or unnecessary and would not normally be considered.

Although compensation for damage is an alternative that requires further investigation, it is very difficult to determine the degree of damage, for example in an early-fall harvested crop, that can be attributed to pronghorn activity during the previous late fall or winter. Range improvements that benefit both landowners and antelope will be considered as one alternative to compensation in chronic damage locations.

3.3.10 Population and Habitat Inventory

Population inventory provides the information on distribution, density, age/sex ratios, productivity and condition of animals, which is essential to meet the resource management and allocation goals for this species. Habitat inventory provides the necessary information on food and cover, which are two of the major factors influencing distribution, density, productivity and condition of animals in the population.

3.3.10.1 Population Inventory

Population inventory involves direct methods where pronghorn antelope are actually observed (e.g., aerial survey) and indirect methods (e.g., jaw collections, harvest questionnaires, range condition surveys, incidence of damage complaints). Direct methods provide information on distribution, density, age/sex ratios and productivity but the information is often limited or incomplete. Indirect methods provide additional information on distribution, density, age distribution within male and female cohorts, and mean age of survival. The techniques used for antelope population inventory will be as follows:

Aerial Surveys - Aerial surveys are the only practical direct population inventory method because of the large geographic area, widely dispersed pronghorn antelope herd, limited manpower and suitability of the habitat to this type of survey. Aerial surveys will be conducted annually in all the Antelope Management Areas according to the methodology laid out in the Provincial Survey Format (Appendix IV). This is different than the current survey format (half the areas surveyed each year), but annual coverage is necessary because of differences in distribution and productivity that occur between management areas on an annual basis.

Jaw Collection - Jaw collections should be made periodically to monitor the age distribution in the herd and the percentage of fawns in the non-trophy harvest.

Harvest Questionnaires - The telephone questionnaire determining hunter effort and pronghorn antelope harvest should be conducted for all Antelope Management Areas annually, sampling 25 percent of the licenced hunters.

Range Condition Surveys (see Habitat Inventory, Section 3.3.10.2)

Damage Complaints - Damage complaints should be monitored as part of the annual damage prevention program.

3.3.10.2 Habitat Inventory

Habitat inventory provides a basis for population inventory, a benchmark to set population goals and a local focus for habitat retention and enhancement programs. The following two types of habitat inventory should occur:

General Assessment - A general assessment, focusing at the 2.6 km^2 (1 sq. mi.) level, should be conducted every 10 years (unless major land use changes warrant a more frequent review). The purpose of this assessment will be to determine the extent of pronghorn antelope summer range and note any changes that might require new habitat retention/enhancement programs.

Winter Range Assessment - Better delineation of winter range, based on antelope use and/or distribution, should be an ongoing annual process. A detailed assessment of winter range, focusing at the 0.7 km^2 (1/4 section) level, should be conducted every five years (unless major land use changes warrant a more frequent review). The purpose of this assessment will be to determine the condition of the range and any loss of habitat and to develop new habitat retention/enhancement strategies as required.

3.3.11 Summary of Goals and Strategies

The primary goal is to manage for a winter population of 15 500 and a summer population of 18 910 pronghorn antelope, which will provide a variety of recreational, scientific and commercial opportunities with a minimum of damage to private property.

Recreational opportunities will include both hunting and non-consumptive use. Resident hunters will be provided with 10 940 recreation days and an average annual harvest of 1670 trophy antelope and 1670 non-trophy antelope with an anticipated hunter success rate of 70 percent for trophy and 80 percent for non-trophy. Hunters will be licenced using a special licence issued through a draw or outfitter-guide allocation. Hunters successful in receiving a Trophy Antelope Special Licence through the draw will not be eligible to apply for that licence during the following two calendar years. Hunting seasons will occur during the months of September and October. A specific number of nonconsumptive user days has not been identified, but efforts will be made to increase public awareness of the resource and contribute to a written guide indicating the best times and locations to view pronghorn antelope.

Scientific study of the resource will be encouraged, particularly in the area of the impact of changing land uses and winter weather on the biology and behavior of pronghorn antelope.

Commercial opportunities will involve the outfitting and guiding of non-resident hunters and tourists.

Identification and protection of important pronghorn antelope range, particularly winter range, will be a high priority. Development of suitable habitat enhancement techniques (for Alberta), to mitigate ongoing habitat losses, will also be a priority.

Mortality factors other than recreational hunting such as winter starvation, parasites and disease, predation, accidental deaths, and illegal harvest will be addressed to varying degrees. Techniques to alleviate high levels of mortality during severe winters will be tested. Parasites and diseases will be monitored during routine necropsies for animals that die accidentally or whose cause of death is unknown. There will be no attempt to control predators beyond current levels of resident trapper harvest and agricultural pest control. Antelope deaths resulting from vehicle collisions, irrigation canals and barbed-wire fences will be monitored and appropriate steps taken if they increase to significant levels. Illegal harvest will be monitored and current high levels of enforcement during the hunting season will be maintained.

Damage to private property will be minimized through prevention and control programs. Prevention will include both scaring efforts for short-term relief and the provision of alternate feeding sites (e.g., lure crops) for longer term relief in chronic damage situations. Hunting will be used to maintain herds at proposed goals and cooperative range management programs will be pursued to provide benefits to both landowners and pronghorn antelope. Compensation for damage will be evaluated as a management measure to determine its feasibility in antelope damage situations.

4.0 MANAGEMENT PLAN APPLICATION

4.1 Provincial Summary

The major management challenges for pronghorn antelope are to maintain a stable antelope population to maximize recreational opportunity, to retain or enhance sufficient habitat to meet population goals, to maintain recreational use within levels acceptable to both users and landowners and to minimize damage to private property.

The summer population goal is 18 910, which requires 25 900 km^2 of summer range (native grass prairie) and the early winter goal is 15 500, which requires 3300 km^2 of winter range (native grass-sagebrush). To maintain the antelope populations at a sustained harvest level and provide an acceptable quality of hunting experience, it is necessary to control the number of hunters and their distribution using a special licence draw. Wait-out periods and limits on hunter licence combinations will help ensure that everybody has a fair chance to hunt. To increase nonconsumptive use, opportunity guides and viewing sites must be provided, but care must be taken to minimize disturbance of landowners and antelope. Habitat retention and enhancement programs on both private and public land must be pursued to ensure maintenance of populations at identified goal levels. Cooperative range management, benefiting both livestock and antelope, is the desired goal. Efforts must also continue to prevent crop damage and to evaluate the feasibility of expanded damage compensation in antelope damage situations.

4.2 Regional Perspective

4.2.1 Southern Region

The Southern Region (Figure 9) has 77 percent of the provincial

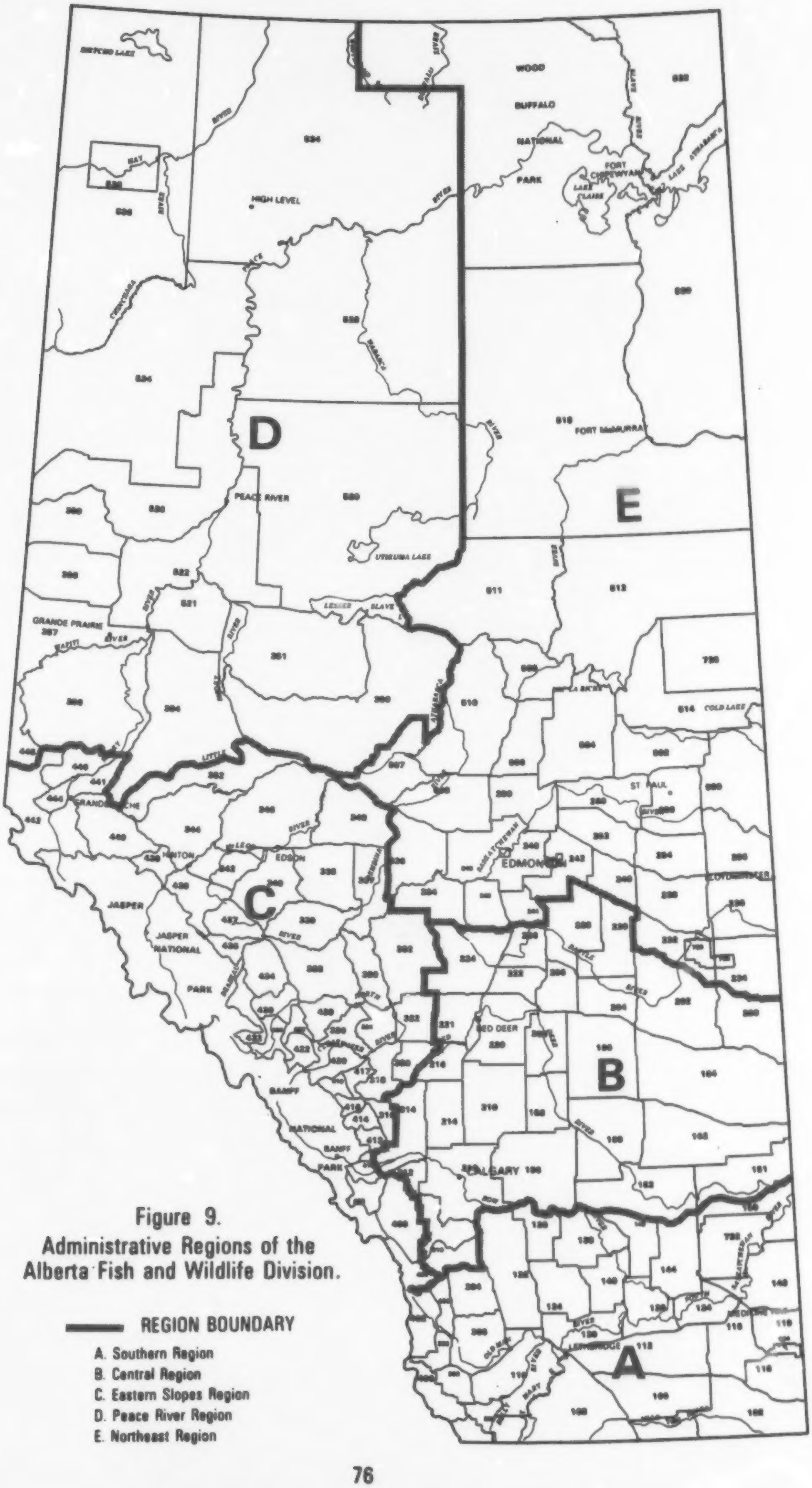
REGION BOUNDARY
A. Southern Region
B. Central Region
C. Eastern Slopes Region
D. Peace River Region
E. Northeast Region
D
E
C
B
A
WOOD BUFFALO NATIONAL PARK
FORT CHIPEWYAN
LAKE ATHABASCA
HIGH LEVEL
FORT McMURRAY
PEACE RIVER
UTIKUMA LAKE
LESSER SLAVE
GRANDE PRAIRIE
COLD LAKE
ST. PAUL
EDMONTON
LLOYDMINSTER
EDSON
HINTON
JASPER
JASPER NATIONAL PARK
RED DEER
BANFF NATIONAL PARK
BANFF
CALGARY
LETHBRIDGE
MEDICINE HAT

Figure 9.
Administrative Regions of the
Alberta Fish and Wildlife Division.

antelope population, demand for antelope hunting is very high and the landscape is dominated by agricultural land that is either privately owned property or leased public land. Population goals are 14 510 antelope in summer, 11 900 in early winter (December) and 10 300 in late winter (April). Management emphasis will be directed towards doing the following:

1. Identifying specific population and habitat retention and enhancement goals for all Wildlife Management Units (WMUs) within the regional antelope range and developing strategies to achieve these goals. Goals will have to be separated into summer and winter periods.
2. Improving the knowledge of antelope movements and use of different seasonal ranges with particular emphasis on better delineation of winter range and its relationship to summer ranges of the different herds.
3. Monitoring populations and habitat to determine the success in maintaining the population and a suitable habitat base to support it.
4. Recommending annual hunting permit allocations and assessing the suitability of the harvest regime for the current population trend and status, as well as for the hunter demand.
5. Identifying potential viewing sites and providing information to the public regarding antelope biology and distribution.
6. Cooperating with domestic livestock range managers to develop range management programs that benefit both antelope and domestic livestock.
7. Improving the prevention of localized pronghorn damage on private land.
8. Exploring ways to incorporate C.F.B. Suffield into the harvest system and overall management of the pronghorn antelope herd in the region.

4.2.2 Central Region

The Central Region (Figure 9) has 23 percent of the provincial antelope population, demand for antelope hunting is very high and the landscape is dominated by agricultural land that is either privately owned property or leased public land. Population goals are 4400 antelope in summer, 3600 in early winter (December) and 3120 in late winter. Management emphasis will be directed towards doing the following:

1. Identifying specific population and habitat retention and enhancement goals for all WMUs within the regional antelope range and developing strategies to achieve these goals. Goals will have to be separated into summer and winter periods.
2. Improving the knowledge of antelope movements and use of different seasonal ranges with particular emphasis on better delineation of winter range and its relationship to summer ranges of the different herds.
3. Monitoring populations and habitat to determine the success in maintaining the population and a suitable habitat base to support it.
4. Recommending annual hunting permit allocations and assessing the suitability of the harvest regime for the current population trend and status, as well as for the hunter demand.
5. Identifying potential viewing sites and providing information to the public regarding antelope biology and distribution.
6. Cooperating with domestic livestock range managers to develop range management programs that benefit both antelope and domestic livestock.
7. Improving the prevention of localized pronghorn damage on private land.

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APPENDIX I.

Estimated Pronghorn Antelope Populations, 1952-1989.

Table A. Estimated antelope populations, 1952-1989.

Year	Estimated Numbers of Antelope Region 1	Region 2	Suffield	Provincial
1952	No Data	No Data	No Data	4 500
1953	No Data	No Data	No Data	5 000
1954	No Data	No Data	No Data	8 000
1955	No Data	No Data	No Data	10 000
1956	No Data	No Data	No Data	15 000
1957	No Data	No Data	No Data	12 500
1958	No Data	No Data	No Data	No Data
1959	No Data	No Data	No Data	11 000
1960	No Data	No Data	No Data	12 200
1961	No Data	No Data	No Data	13 000
1962	No Data	No Data	No Data	11 500
1963	11 750	5 860	1 430	19 040
1964	14 314	3 863	2 000	20 177
1965	9 922	4 309	No Data	14 231
1966	8 546	3 882	No Data	12 428
1967	6 404	1 843	1 790	10 037
1968	4 850	3 150	1 660	9 660
1969	3 483	1 517	1 210	6 210
1970	7 959	2 071	1 370	11 400
1971	7 242	1 342	840	9 424
1972	6 766	2 385	1 260	10 411
1973	6 736	2 171	1 720	10 627

(continued)

Table A (continued)

Year	Estimated Numbers of Antelope			
	Region 1	Region 2	Suffield	Provincial
1974	6 745	2 610	1 760	11 115
1975	6 241	4 136	1 400	11 777
1976	8 972	5 751	2 090	16 813
1977	9 527	5 756	2 670	17 953
1978	6 915	2 574	1 430	10 919
1979	7 288	5 492	2 550	15 330
1980	8 410	7 067	3 160	18 637
1981	9 597	8 960	2 150	20 707
1982	13 957	3 605	3 640	21 202
1983	No Survey			
1984	21 173	7 898	3 000	32 071
1985	15 087	6 067	3 020	24 174
1986	15 350	7 450	2 100	24 900
1987	17 807	8 402	2 000	28 209
1988	14 515	5 592	3 000	23 107
1989	14 475	4 839	3 000	22 314

Region 1 - WMUs 102, 104, 106, 108, 112, 114, 116, 124, 126, 128, 138, 140, 142, 144 and 148.

Region 2 - WMUs 150, 151, 152, 160, 162, 164.

Suffield - WMU 732.

The WMUs above, used to define Region 1, Region 2 and Suffield, are the current WMUs. However, these same geographic areas were used to compile the data for all years without regard to earlier WMU boundaries (which in many cases were different than current boundaries).

APPENDIX II.

Estimated Pronghorn Antelope Harvest by Antelope Management Area, 1973-1989. Data for all years were adjusted to conform to the geographic boundaries of the current Antelope Management Areas.

Table A. Licence sales and estimated harvest in Antelope Management Area A from 1973-1989.

Year	Trophy					Non-trophy				
	Licences Issued	% Active Hunters	No. Active Hunters	% Hunter Success	Estimated Harvest	Licences Issued	% Active Hunters	No. Active Hunters	% Hunter Success	Estimated Harvest
1973	202	96	194	70	136	Closed	Nil	Nil	Nil	Nil
1974	201	95	191	62	118	Closed	Nil	Nil	Nil	Nil
1975	184	94	173	73	126	Closed	Nil	Nil	Nil	Nil
1976	205	94	193	73	141	Closed	Nil	Nil	Nil	Nil
1977	252	92	232	75	174	150	86	129	72	93
1978	235	91	214	66	141	Closed	Nil	Nil	Nil	Nil
1979	188	94	177	75	133	Closed	Nil	Nil	Nil	Nil
1980	275	96	264	71	187	212	78	165	77	127
1981	313	85	266	84	223	188	78	147	66	97
1982	364	90	328	79	259	79	78	62	78	48
1983	393	93	365	73	266	124	73	91	84	76
1984	298	91	271	64	173	320	88	282	64	180
1985	292	83	242	70	169	89[a]	84	75	92	69
1986	122	86	105	70	73	30	83	25	84	21
1987	139	90	125	75	94	126	87	110	70	77
1988	251	93	234	66	155	225	86	193	58	111
1989	270	87	234	64	150	216	75	163	71	115

[a] Two tags.

Table B. Licence sales and estimated harvest in Antelope Management Area B from 1973-1989.

Year	Trophy					Non-trophy				
	Licences Issued	% Active Hunters	No. Active Hunters	% Hunter Success	Estimated Harvest	Licences Issued	% Active Hunters	No. Active Hunters	% Hunter Success	Estimated Harvest
1973	276	95	262	76	199	Closed	Nil	Nil	Nil	Nil
1974	303	93	282	69	195	Closed	Nil	Nil	Nil	Nil
1975	258	96	248	70	174	Closed	Nil	Nil	Nil	Nil
1976	302	95	287	80	230	Closed	Nil	Nil	Nil	Nil
1977	303	89	270	77	208	Closed	Nil	Nil	Nil	Nil
1978	147	91	134	76	102	Closed	Nil	Nil	Nil	Nil
1979	152	95	144	81	117	Closed	Nil	Nil	Nil	Nil
1980	164	95	156	86	134	67	85	57	82	47
1981	347	91	316	87	275	100	76	76	80	61
1982	316	94	297	78	232	149	81	121	74	90
1983	407	94	383	75	287	128	78	100	92	92
1984	150	94	141	64	90	292	82	239	65	155
1985	57	82	47	70	33	34	91	31	97	30
1986	84	92	77	68	52	55	87	48	71	34
1987	99	88	87	90	78	164	81	133	66	108
1988	83	92	76	87	66	133	85	113	85	96
1989	122	91	111	70	78	141	87	125	88	110

Table C. Licence sales and estimated harvest in Antelope Management Area C from 1973-1989.

	Trophy					Non-trophy				
Year	Licences Issued	% Active Hunters	No. Active Hunters	% Hunter Success	Estimated Harvest	Licences Issued	% Active Hunters	No. Active Hunters	% Hunter Success	Estimated Harvest
1973	303	97	294	76	223	Closed	Nil	Nil	Nil	Nil
1974	300	93	279	74	206	Closed	Nil	Nil	Nil	Nil
1975	307	94	289	78	225	Closed	Nil	Nil	Nil	Nil
1976	352	94	331	70	232	Closed	Nil	Nil	Nil	Nil
1977	351	90	316	82	259	143	80	114	64	73
1978	192	94	180	61	110	Closed	Nil	Nil	Nil	Nil
1979	94	93	87	74	64	Closed	Nil	Nil	Nil	Nil
1980	218	91	198	77	152	93	81	75	82	62
1981	332	88	292	85	248	104	84	87	70	61
1982	376	92	346	83	287	94	78	73	90	66
1983	307	90	276	85	235	100	84	84	93	78
1984	506	90	455	76	346	168	84	141	70	99
1985	503	94	473	83	393	36	75	27	37	10
1986	333	88	294	87	256	31	81	25	80	20
1987	597	90	537	80	429	260[a]	87	227	114	258
						337	100	337	55	186
1988	321	88	281	91	257	370	82	305	73	222
1989	606	94	570	91	517	694	70	484	73	351

[a] Two tags.

Table D. Licence sales and estimated harvest in Antelope Management Area D from 1973-1989.

	Trophy					Non-trophy				
Year	Licences Issued	% Active Hunters	No. Active Hunters	% Hunter Success	Estimated Harvest	Licences Issued	% Active Hunters	No. Active Hunters	% Hunter Success	Estimated Harvest
1973	Closed	Nil	Nil	Nil	Nil	Closed	Nil	Nil	Nil	Nil
1974	Closed	Nil	Nil	Nil	Nil	Closed	Nil	Nil	Nil	Nil
1975	60	100	60	96	58	Closed	Nil	Nil	Nil	Nil
1976	61	88	54	94	51	Closed	Nil	Nil	Nil	Nil
1977	60	96	58	92	53	70	95	67	79	53
1978	30	89	27	83	22	Closed	Nil	Nil	Nil	Nil
1979	59	90	53	91	48	Closed	Nil	Nil	Nil	Nil
1980	69	98	68	91	62	24	94	23	94	22
1981	75	96	72	92	66	22	78	17	100	17
1982	39	97	38	97	37	46	80	37	91	34
1983	71	94	67	92	62	52	96	50	94	47
1984	277	94	260	92	239	232	91	211	91	192
1985	290	90	261	89	232	157	100	157	95	149
1986	258	92	238	92	218	374	93	349	93	323
1987	95	100	95	92	87	290[a]	81	235	123	288
						62	100	62	32	20
1988	124	100	124	80	99	210	76	159	75	119
1989	121	100	121	88	106	30	100	30	63	19

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[a] Two tags.

Table E. Licence sales and estimated harvest in Antelope Management Area E from 1973-1989.

	Trophy					Non-trophy				
Year	Licences Issued	% Active Hunters	No. Active Hunters	% Hunter Success	Estimated Harvest	Licences Issued	% Active Hunters	No. Active Hunters	% Hunter Success	Estimated Harvest
1973	Closed	Nil	Nil	Nil	Nil	Closed	Nil	Nil	Nil	Nil
1974	Closed	Nil	Nil	Nil	Nil	Closed	Nil	Nil	Nil	Nil
1975	212	94	199	82	163	Closed	Nil	Nil	Nil	Nil
1976	227	94	213	67	143	Closed	Nil	Nil	Nil	Nil
1977	228	90	205	75	154	60	86	52	76	40
1978	89	86	77	78	60	Closed	Nil	Nil	Nil	Nil
1979	146	90	131	83	109	Closed	Nil	Nil	Nil	Nil
1980	224	94	211	80	169	165	86	142	79	112
1981	363	91	330	88	290	203	70	142	80	114
1982	140	91	127	86	109	170	76	129	84	108
1983	381	93	354	84	297	247	83	205	93	191
1984	593	92	546	69	377	1169	84	982	70	687
1985	590	92	543	66	358	369[a]	91	336	120	403
1986	419	98	411	80	327	599	86	518	79	410
1987	518	90	468	77	361	631[a]	98	617	111	683
						347	100	347	77	266
1988	519	85	442	83	366	498	60	299	67	199
1989	385	100	385	87	336	32	81	26	81	21

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[a] Two tags.

Table F. Licence sales and estimated harvest in Antelope Management Area F from 1973-1989.

Year	Trophy					Non-trophy				
	Licences Issued	% Active Hunters	No. Active Hunters	% Hunter Success	Estimated Harvest	Licences Issued	% Active Hunters	No. Active Hunters	% Hunter Success	Estimated Harvest
1973	302	99	299	81	242	Closed	Nil	Nil	Nil	Nil
1974	326	93	303	74	224	Closed	Nil	Nil	Nil	Nil
1975	326	94	306	88	269	Closed	Nil	Nil	Nil	Nil
1976	347	94	326	83	271	Closed	Nil	Nil	Nil	Nil
1977	301	93	280	92	258	200	86	172	85	146
1978	193	93	179	82	147	Closed	Nil	Nil	Nil	Nil
1979	230	96	221	92	203	Closed	Nil	Nil	Nil	Nil
1980	304	96	292	89	260	182	94	171	93	159
1981	162	94	152	97	147	312	85	265	83	220
1982	389	94	366	93	340	428	83	355	92	327
1983	549	93	511	93	475	339	84	285	98	279
1984	791	90	712	90	641	1520	85	1292	87	1124
1985	514	96	493	86	424	221	96	212	43	91
1986	784	91	715	95	681	649	86	561	86	484
1987	788	91	720	88	630	847[a]	96	810	109	883
						561	100	561	62	350
1988	586	90	527	85	449	889	94	833	80	667
1989	599	83	495	89	443	500	90	452	84	381

[a] Two tags.

Table G. Licence sales and estimated harvest in Antelope Management Area G from 1973-1989.

	Trophy					Non-trophy				
Year	Licences Issued	% Active Hunters	No. Active Hunters	% Hunter Success	Estimated Harvest	Licences Issued	% Active Hunters	No. Active Hunters	% Hunter Success	Estimated Harvest
1973	Closed	Nil	Nil	Nil	Nil	Closed	Nil	Nil	Nil	Nil
1974	Closed	Nil	Nil	Nil	Nil	Closed	Nil	Nil	Nil	Nil
1975	127	98	124	85	105	Closed	Nil	Nil	Nil	Nil
1976	228	95	217	90	195	Closed	Nil	Nil	Nil	Nil
1977	353	95	335	87	291	250	88	220	88	194
1978	120	95	114	82	93	Closed	Nil	Nil	Nil	Nil
1979	290	93	270	89	240	Closed	Nil	Nil	Nil	Nil
1980	318	96	305	96	293	180	96	173	88	152
1981	317	94	298	87	259	417	84	350	81	284
1982	404	95	384	90	346	477	88	420	85	357
1983	572	94	538	91	490	574	81	465	93	432
1984	497	93	462	86	397	1464	84	1230	80	984
1985	464	95	441	61	269	602[a]	92	554	128	709
1986	497	94	467	82	385	1119	77	861	84	724
1987	745	96	716	81	581	862[a]	95	817	104	847
						557	100	557	56	312
1988	429	90	388	94	363	734	79	582	78	456
1989	500	100	500	94	472	291	100	291	89	258

[a] Two tags.

Table H. Licence sales and estimated harvest in Antelope Management Area H[a] from 1973-1989.

	Trophy					Non-trophy				
Year[a]	Licences Issued	% Active Hunters	No. Active Hunters	% Hunter Success	Estimated Harvest	Licences Issued	% Active Hunters	No. Active Hunters	% Hunter Success	Estimated Harvest
1973										
1974										
1975										
1976										
1977										
1978										
1979										
1980										
1981										
1982										
1983										
1984	626	94	588	56	329	1460	88	1285	58	745
1985	499	91	454	51	232	438[b]	87	381	92	351
1986	670	92	616	42	261	813	86	700	67	466
1987	389	96	372	82	304	756[b]	95	715	109	779
						295	100	295	55	162
1988	527	95	500	96	482	636	71	452	72	326
1989	400	95	378	100	378	542	75	404	68	276

[a] This management area was not created until the 1984 season.

[b] Two tags.

APPENDIX III.

Pronghorn Antelope Buck:Doe:Fawn Ratios by Antelope Management Area, 1963-1989. Data for all years were adjusted to conform to the geographic boundaries of the current Antelope Management Areas.

Table A. Pronghorn densities, sex ratios and productivity for Antelope Management Area A from 1963-1989.

			Composition On and Off Transect			Ratio		
Year	Total Antelope On Transect	Density Per km^2	Male	Female	Fawn	Buck	Doe	Fawn
1963	123	0.33	-	-	-	-	-	-
1964	130	0.35	-	-	-	-	-	-
1965	155	0.46	-	-	-	-	-	-
1966	734	0.43	-	-	-	-	-	-
1967	107	0.35	25	51	30	49	100	59
1968	290	0.52	63	123	118	51	100	96
1969	-	-	-	-	-	-	-	-
1970	180	0.48	59	88	64	67	100	73
1971	259	0.69	74	121	100	61	100	83
1972	237	0.64	84	113	105	74	100	93
1973	259	0.69	115	184	99	63	100	54
1974	358	0.96	51	202	116	25	100	57
1975	264	0.71	60	180	112	33	100	62
1976	540	1.45	110	295	214	37	100	73
1977	642	1.72	143	302	258	47	100	85
1978	547	1.47	136	269	231	51	100	86
1979	410	1.10	68	234	204	29	100	87
1980	661	1.77	143	351	225	41	100	64
1981	499	1.34	133	229	178	58	100	78
1982	670	1.80	191	383	183	50	100	48
1983	-	-	-	-	-	-	-	-
1984	317	1.02	74	170	110	44	100	65
1985	288	0.93	65	146	77	45	100	53
1986	190	0.61	44	104	60	42	100	58
1987	-	-	-	-	-	-	-	-
1988	286	0.92	67	141	78	48	100	55
1989	-	-	-	-	-	-	-	-
TOTAL	8146	0.84	1705	3686	2562	46	100	70

Table B. Pronghorn densities, sex ratios and productivity for Antelope Management Area B from 1963-1989.

Year	Total Antelope On Transect	Density Per km^2	Composition On and Off Transect			Ratio		
			Male	Female	Fawn	Buck	Doe	Fawn
1963	65	0.35	-	-	-	-	-	-
1964	81	0.44	-	-	-	-	-	-
1965	353	0.59	-	-	-	-	-	-
1966	235	1.06	-	-	-	-	-	-
1967	107	0.38	34	53	17	64	100	32
1968	66	0.28	12	49	28	24	100	57
1969	-	-	-	-	-	-	-	-
1970	153	0.62	43	68	46	63	100	68
1971	181	0.36	55	107	71	51	100	66
1972	196	0.39	55	122	54	45	100	44
1973	58	0.12	13	31	14	42	100	45
1974	94	0.19	7	68	52	10	100	76
1975	245	0.49	29	168	77	17	100	46
1976	168	0.34	26	108	54	24	100	50
1977	212	0.43	34	141	51	24	100	36
1978	216	0.43	34	111	77	31	100	69
1979	268	0.36	33	133	124	25	100	93
1980	307	0.41	86	180	100	48	100	56
1981	292	0.59	69	141	92	49	100	65
1982	275	0.55	91	138	65	66	100	47
1983	-	-	-	-	-	-	-	-
1984	86	0.17	37	176	82	21	100	47
1985	47	0.09	83	176	64	47	100	36
1986	-	-	-	-	-	-	-	-
1987	-	-	-	-	-	-	-	-
1988	-	-	-	-	-	-	-	-
1989	-	-	-	-	-	-	-	-
TOTAL	3705	0.39	741	1970	1068	38	100	54

Table C. Pronghorn densities, sex ratios and productivity for Antelope Management Area C from 1963-1989.

Year	Total Antelope On Transect	Density Per km^2	Composition On and Off Transect			Ratio		
			Male	Female	Fawn	Buck	Doe	Fawn
1963	2 380	0.92	-	-	-	-	-	-
1964	1 255	0.97	-	-	-	-	-	-
1965	409	0.60	-	-	-	-	-	-
1966	2 097	0.83	-	-	-	-	-	-
1967	256	0.42	36	111	83	32	100	75
1968	395	0.49	108	202	160	53	100	79
1969	-	-	-	-	-	-	-	-
1970	619	0.66	186	267	219	70	100	82
1971	518	0.56	135	316	137	43	100	43
1972	440	0.47	135	236	120	57	100	51
1973	536	0.57	194	364	117	53	100	32
1974	595	0.64	143	383	181	37	100	47
1975	362	0.39	92	255	110	36	100	43
1976	651	0.70	138	405	258	34	100	64
1977	717	0.77	195	400	153	49	100	38
1978	361	0.39	84	225	107	37	100	48
1979	617	0.66	81	319	248	25	100	78
1980	498	0.53	122	318	119	38	100	37
1981	619	0.66	167	342	180	49	100	53
1982	664	0.71	210	404	186	52	100	46
1983	-	-	-	-	-	-	-	-
1984	676	0.78	174	429	131	41	100	31
1985	516	0.59	74	163	50	45	100	31
1986	-	-	-	-	-	-	-	-
1987	658	0.76	182	413	166	44	100	40
1988	-	-	-	-	-	-	-	-
1989	960	1.10	294	578	164	51	100	28
TOTAL	16 799	0.69	2 750	6 130	2 889	45	100	47

Table D. Pronghorn densities, sex ratios and productivity for Antelope Management Area D from 1963-1989.

			Composition On and Off Transect			Ratio		
Year	Total Antelope On Transect	Density Per km^2	Male	Female	Fawn	Buck	Doe	Fawn
1963	93	0.50	-	-	-	-	-	-
1964	78	0.42	-	-	-	-	-	-
1965	36	0.19	-	-	-	-	-	-
1966	30	0.16	-	-	-	-	-	-
1967	37	0.07	7	17	13	41	100	76
1968	43	0.13	6	22	19	27	100	86
1969	-	-	-	-	-	-	-	-
1970	-	-	-	-	-	-	-	-
1971	-	-	-	-	-	-	-	-
1972	-	-	-	-	-	-	-	-
1973	-	-	-	-	-	-	-	-
1974	-	-	-	-	-	-	-	-
1975	177	0.74	71	85	52	84	100	61
1976	353	1.48	120	110	131	109	100	119
1977	211	1.23	98	173	102	57	100	59
1978	90	0.38	18	52	40	35	100	77
1979	330	1.06	49	146	147	34	100	101
1980	371	1.19	96	246	142	39	100	58
1981	244	0.79	89	140	97	64	100	69
1982	253	0.81	45	119	91	38	100	76
1983	-	-	-	-	-	-	-	-
1984	656	2.01	193	294	209	66	100	71
1985	266	1.04	100	129	89	78	100	69
1986	-	-	-	-	-	-	-	-
1987	254	0.99	49	163	96	30	100	59
1988	-	-	-	-	-	-	-	-
1989	180	0.70	67	70	50	96	100	71
TOTAL	3702	0.77	1008	1766	1278	57	100	73

Table E. Pronghorn densities, sex ratios and productivity for Antelope Management Area E from 1963-1989.

			Composition On and Off Transect			Ratio		
Year	Total Antelope On Transect	Density Per km^2	Male	Female	Fawn	Buck	Doe	Fawn
1963	3 584	1.39	-	-	-	-	-	-
1964	4 049	1.58	-	-	-	-	-	-
1965	354	0.50	-	-	-	-	-	-
1966	565	0.48	-	-	-	-	-	-
1967	240	0.24	48	92	59	52	100	64
1968	-	-	-	-	-	-	-	-
1969	-	-	-	-	-	-	-	-
1970	187	0.33	77	90	20	86	100	22
1971	145	0.14	29	99	52	29	100	53
1972	331	0.32	92	157	117	59	100	75
1973	234	0.23	97	101	70	96	100	69
1974	264	0.31	50	137	96	36	100	70
1975	538	0.63	152	267	184	57	100	69
1976	522	0.61	167	293	257	57	100	88
1977	549	0.82	146	304	209	48	100	69
1978	227	0.34	58	92	89	63	100	97
1979	455	0.53	94	215	217	44	100	101
1980	658	0.77	204	388	277	53	100	71
1981	667	0.64	163	351	297	46	100	85
1982	717	0.69	158	516	418	31	100	81
1983	-	-	-	-	-	-	-	-
1984	1 109	1.30	246	591	424	42	100	72
1985	696	1.70	163	365	230	45	100	63
1986	555	1.24	119	309	235	39	100	76
1987	722	1.67	163	342	286	48	100	84
1988	381	1.05	122	240	113	51	100	47
1989	345	0.80	107	161	82	66	100	51
TOTAL	18 094	0.81	2 455	5 110	3 732	48	100	73

Table F. Pronghorn densities, sex ratios and productivity for Antelope Management Area F from 1963-1989.

Year	Total Antelope On Transect	Density Per km^2	Composition On and Off Transect			Ratio		
			Male	Female	Fawn	Buck	Doe	Fawn
1963	1 018	0.50	-	-	-	-	-	-
1964	1 025	0.61	-	-	-	-	-	-
1965	1 205	0.55	-	-	-	-	-	-
1966	563	0.41	-	-	-	-	-	-
1967	778	0.47	174	285	189	61	100	66
1968	783	0.41	229	381	300	60	100	79
1969	-	-	-	-	-	-	-	-
1970	561	0.75	93	243	202	38	100	83
1971	522	0.52	176	255	184	69	100	72
1972	534	0.54	154	263	197	59	100	75
1973	655	0.66	95	389	207	24	100	53
1974	524	0.53	91	318	187	29	100	59
1975	516	0.52	136	344	156	40	100	45
1976	587	0.59	149	314	217	47	100	69
1977	591	0.59	126	420	227	30	100	54
1978	473	0.47	78	290	180	27	100	62
1979	485	0.49	93	231	232	40	100	100
1980	579	0.58	137	319	188	43	100	59
1981	870	0.87	144	482	317	30	100	66
1982	609	0.61	205	307	153	67	100	50
1983	-	-	-	-	-	-	-	-
1984	1 109	0.90	293	580	317	51	100	55
1985	582	0.47	140	314	188	45	100	60
1986	933	0.76	227	580	336	39	100	58
1987	-	-	-	-	-	-	-	-
1988	850	0.69	187	476	226	39	100	47
1989	-	-	-	-	-	-	-	-
TOTAL	16 352	0.57	2 327	6 791	4 203	43	100	62

Table G. Pronghorn densities, sex ratios and productivity for Antelope Management Area G from 1963-1989.

Year	Total Antelope On Transect	Density Per km^2	Composition On and Off Transect			Ratio		
			Male	Female	Fawn	Buck	Doe	Fawn
1963	473	0.55	-	-	-	-	-	-
1964	384	0.83	-	-	-	-	-	-
1965	373	0.44	-	-	-	-	-	-
1966	1079	0.41	-	-	-	-	-	-
1967	310	0.20	40	122	88	33	100	72
1968	-	-	-	-	-	-	-	-
1969	-	-	-	-	-	-	-	-
1970	158	0.26	54	63	41	86	100	65
1971	84	0.16	11	55	28	20	100	51
1972	85	0.16	12	45	34	27	100	76
1973	103	0.20	10	61	37	16	100	61
1974	163	0.31	20	81	62	25	100	77
1975	67	0.22	15	52	35	29	100	67
1976	190	0.63	31	93	75	33	100	81
1977	71	0.14	15	45	18	33	100	40
1978	82	0.16	2	52	28	4	100	54
1979	154	0.26	18	40	38	45	100	95
1980	243	0.40	24	88	70	27	100	80
1981	87	0.16	17	41	29	41	100	71
1982	132	0.25	35	85	46	41	100	54
1983	-	-	-	-	-	-	-	-
1984	567	0.53	144	346	176	42	100	51
1985	370	0.41	43	156	75	28	100	48
1986	-	-	-	-	-	-	-	-
1987	599	0.63	141	317	214	44	100	68
1988	-	-	-	-	-	-	-	-
1989	343	0.36	106	170	89	62	100	52
TOTAL	6117	0.36	738	1912	1183	39	100	62

Table H. Pronghorn densities, sex ratios and productivity for Antelope Management Area H from 1963-1989.

Year	Total Antelope On Transect	Density Per km^2	Composition On and Off Transect			Ratio		
			Male	Female	Fawn	Buck	Doe	Fawn
1963	748	0.32	-	-	-	-	-	-
1964	695	0.29	-	-	-	-	-	-
1965	529	0.19	-	-	-	-	-	-
1966	547	0.21	-	-	-	-	-	-
1967	229	0.09	36	119	63	30	100	53
1968	-	-	-	-	-	-	-	-
1969	-	-	-	-	-	-	-	-
1970	-	-	-	-	-	-	-	-
1971	16	0.04	4	5	7	80	100	140
1972	20	0.08	13	5	3	260	100	60
1973	22	0.09	19	16	10	119	100	63
1974	25	0.10	6	15	4	40	100	27
1975	49	0.10	23	12	3	192	100	25
1976	110	0.22	65	46	29	141	100	63
1977	90	0.18	45	92	62	49	100	67
1978	74	0.15	15	32	27	47	100	84
1979	381	0.33	99	73	57	136	100	78
1980	361	0.31	76	132	81	58	100	61
1981	496	0.49	112	274	175	41	100	64
1982	396	0.39	61	166	87	37	100	52
1983	-	-	-	-	-	-	-	-
1984	631	0.50	167	384	211	43	100	55
1985	552	0.41	151	351	202	43	100	58
1986	520	0.46	131	326	203	40	100	62
1987	-	-	-	-	-	-	-	-
1988	362	0.32	119	218	158	55	100	72
1989	-	-	-	-	-	-	-	-
TOTAL	6853	0.19	1142	2266	1382	50	100	60

Table I. Pronghorn densities, sex ratios and productivity for Suffield from 1963-1989.

Year	Total Antelope On Transect	Density Per km^2	Composition On and Off Transect			Ratio		
			Male	Female	Fawn	Buck	Doe	Fawn
1963	-	-	-	-	-	-	-	-
1964	-	-	-	-	-	-	-	-
1965	-	-	-	-	-	-	-	-
1966	-	-	-	-	-	-	-	-
1967	878	0.69	-	-	-	-	-	-
1968	814	0.64	-	-	-	-	-	-
1969	594	0.47	-	-	-	-	-	-
1970	670	0.53	-	-	-	-	-	-
1971	413	0.33	103	194	127	53	100	65
1972	618	0.49	164	301	191	54	100	63
1973	844	0.67	288	437	182	66	100	42
1974	804	0.68	264	390	274	68	100	70
1975	686	0.54	232	334	187	69	100	56
1976	757	0.81	287	393	280	73	100	71
1977	1 310	1.03	388	640	384	61	100	60
1978	691	0.55	165	329	210	50	100	64
1979	620	0.99	149	252	240	59	100	95
1980	769	1.22	193	345	254	56	100	74
1981	369	0.83	131	148	110	89	100	74
1982	884	1.40	378	366	222	103	100	61
1983	-	-	-	-	-	-	-	-
1984	-	-	-	-	-	-	-	-
1985	735	1.17	232	365	146	64	100	40
1986	426	0.68	103	207	116	50	100	50
1987	-	-	-	-	-	-	-	-
1988	-	-	-	-	-	-	-	-
1989	-	-	-	-	-	-	-	-
TOTAL	12 882	0.70	3 077	4 701	2 923	65	100	62

APPENDIX IV.

Provincial Pronghorn Antelope Survey Format.

SURVEY TECHNIQUE

TIMING

1. One half of the Antelope Management Areas in each of the Central and Southern Regions will be surveyed on an annual, rotating basis.

2. At least one block will be surveyed per Wildlife Management Unit in each Antelope Management Area being surveyed.

3. Antelope inventories will begin July 15 and block coverage for the Southern and Central Regions will be concurrent and consistent with Table A.

4. Daily inventory coverage will be provided by two flights with pre-scheduled departures of 0600 and 1600 hours. The duration of each flight will not exceed four hours.

METHODOLOGY

1. Every transect line within scheduled monitor blocks will receive aerial coverage by accurately flying the fixed wing aircraft along each line at an altitude of 60 m - 90 m above ground level and a ground speed of 120 km/h - 160 km/h. Altitude and airspeed are ultimately governed by the terrain being traversed and the prevailing wind conditions.

2. The inventory crew will consist of four experienced survey personnel including a pilot, navigator and two primary observers. The two primary observers will occupy the rear seats and each is responsible for continuous visual coverage of a 0.8 km (0.5 mi.) scan strip. The navigator, seated right of the pilot, is responsible for maintaining an accurate course, recording all pertinent information on data forms and maps, judging observations as either "on" or "off" transect, aiding with herd classifications and assisting with observing duties as time permits.

TABLE A. Specific monitor blocks to be surveyed over a three-year term (1985-87).

AMA[a]	WMU[b]	Block	Year 1985	Year 1986	Year 1987
A	108	A	x	x	
B	104/106	H	x		x
	112	SF	x		x
C	102	B & C	x		
D	128/140	MA	x		x
E	138	K	x	x	
	142	N	x	x	
	144	R, T, J	x	x	
F	116	I	x	x	
	119	E	x	x	
	124	BW	x	x	
	148	F & G	x	x	
Southern Total			16	11	5
G	150	BJ	x		x
	151	AC & V	x		x
	152	EB, P, O	x		x
H	160	O	x	x	
	162	BC, P & V, RS	x	x	
	164	U	x	x	
Central Total			9	4	5
Provincial Total			25	15	10

[a] AMA - Antelope Management Area.
[b] WMU - Wildlife Management Unit.

3. All "on" transect observations are accurately counted, classified (bucks, does and kids) and separately recorded per transect line. In many instances this information for small herds can be achieved without deviating from the transect line. Such information for large herds requires a cooperative effort by the navigator (kid count) and right rear observer (buck and total count) and may require multiple checks until confidence in the count can be established. The doe segment is calculated by subtracting the two known components from the total count. In many cases the left rear observer can participate in this exercise thus providing an accuracy check.

4. When it is apparent that sample sizes on monitor blocks are relatively small, "off" transect observations should be similarly counted and classified to increase the sample size and hence accuracy of projected sex/age ratios. All such information is separately notated and excluded from density projections.

5. This survey format was implemented in 1986 as per Table B.

Table B: Provincial survey design for antelope (to be initiated in 1986).

	Year 1			Year 2		
		Aircraft			Aircraft	
Region	AMA[a]	Hours[b]	Cost ($)[c]	AMA[a]	Hours[b]	Cost ($)[c]
Southern	A	4	640	B	3	480
	E	8	1280	C	8	1280
	F	11	1760	D	6	960
Sub-Total		23	3680		17	2720
Central	H	10	1600	G	10	1600
Sub-Total		10	1600		10	1600
Total		33	5280		27	4320

[a] AMA - Antelope Management Area.

[b] All hours are for fixed-wing aircraft.

[c] Cost calculated using: $160.00/hour fixed wing (Charter - "dry" rate).

APPENDIX V.

Ingredient List For Experimental Rations Used in Feeding Trials With Wild Pronghorns.

Ingredient list for experimental rations used in field trials with wild pronghorn antelope in 1983 in Colorado and the winter of 1985-86 in Alberta.

List of Ingredients

Alberta Ration	Colorado Ration
Bentonite	Bentonite
Barley	Barley
Corn	Corn
Canola Meal[a]	Milo
Oats	Oats
Wheat Mids	Wheat Mids
Beet Pulp	Beet Pulp
Distiller's Grain[b]	Dry Brewer's Grain
Molasses	Molasses
Trace Mineral Package	Trace Mineral Package
Vitamin Package	Vitamin Package
(Vitamin E 20 units/kilo)	(Vitamin E 20 units/kilo)

[a] Canola Meal was substituted for Milo in the Alberta ration because of the availability of the product in western Canada.

[b] Distiller's Grain is an analogous name for Dehydrated Brewer's Grain.

APPENDIX VI.

Pronghorn Antelope Stable Population Model for Alberta.

PRONGHORN MODEL FOR ALBERTA

Time	Females			Males		
	Adult	Yrlg.	Fawn	Adult	Yrlg.	Fawn
Spring	1 000	293	1 000	284	293	1 000
Summer Mortality	10(1%)	3(1%)	600(60%)	3(1%)	3(1%)	600(60%)
Fall (Preseason)	990	290	400	281	290	400
Hunting Mortality	129(13%)	48(17%)	27(7%)	189(67%)	57(20%)	27(7%)
Fall (Postseason)	861	242	373	92	233	373
Winter Mortality	76(9%)	27(11%)	80(21%)	15(16%)	26(11%)	80(21%)
Spring	785+215	293		77 + 207	293	

Spring Sex Ratio	45 bucks:100 does
Fall (Preseason)	45 bucks:100 does:63 fawns
Fall (Postseason)	30 bucks:100 does:68 fawns
Late Winter	28 bucks:100 does:59 fawns

The preseason population is $\frac{2641}{2174}$ = 1.21 times larger than postseason

$\frac{2651}{1870}$ = 1.42 times larger than late winter

Annual Recruitment = $\frac{\text{Number of Spring Yearlings}}{\text{Spring Yearlings + Adults}}$ = 0.29

Rationale for the Pronghorn Antelope Stable Population Model for Alberta

1. It was assumed that the number of fawns per doe at birth was 2 for does older than one year and 0 for yearlings (Mitchell 1980, Barrett 1981).

2. It was assumed that the survival rate for fawns through to the fall preseason was 40 percent (Barrett 1982, Summer Population Surveys 1963-1985).

3. It was assumed that the annual mortality between fall preseason and the following spring was 29 percent. This was calculated by comparing preseason estimates of one year with predicted spring population (calculated by backdating the following years preseason survey) the following year.

4. It was assumed that the 29 percent mortality (including both hunting and winter mortality) could reasonably be translated into a hunting mortality rate of 18 percent (similar to the rate actually used in many years) of the preseason population followed by a winter mortality rate of 14 percent of the postseason population. The hunting mortality was assigned with 57 percent going to the male (trophy) cohort and 43 percent going to the female/fawn (non-trophy) cohort, which is similar to that used in many years.

5. It was assumed that adults, yearlings and fawns would make up 55 percent, 21 percent and 25 percent, respectively, of the non-trophy harvest (Treichel, Incisor Bar Age Reports, 1980-1982) and that yearling males would make up 22 percent of the trophy harvest (Treichel, Incisor Bar Age Reports, 1977-1982).

6. It was assumed that the summer antelope survey reflects an accurate age:sex composition of the population (Mean from 1963-1985 was 45 bucks:100 does:63 fawns).

7. There are no data on actual winter mortality rates in Alberta but the assumed rate of 14 percent of the postseason population should be reasonable based on harvest rates and productivity information for known populations. Winter mortality rates for various age cohorts are unknown and were arbitrarily determined based on the following hierarchy of vulnerability. Fawns are most vulnerable because of their small size and inexperience; their assumed winter mortality rate was calculated to reduce their numbers to the predicted yearling population the following spring. Adult males are next in vulnerability because of their relatively poor condition going into winter following the rut. Yearlings would be next because of their inexperience, followed by adult does, which are the least vulnerable. Percentages chosen for yearlings and adults were those required to reduce their numbers to predicted populations the following spring.

8. The population model is intended to represent an average event in a stable population. It has been used to establish population and age/sex structure goals and average harvest goals in the management plan. It is recognized that actual events in any one year may be quite different than those predicted by the model.